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Energy Research Abstracts

Abstracts 11404–14285

Office of Scientific and Technical Information
UNITED STATES DEPARTMENT OF ENERGY

The Office of Scientific and Technical Information

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UNITED STATES DEPARTMENT OF ENERGY
Office of Scientific and Technical Information
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Energy Research Abstracts

Coverage

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports and patent applications originated by the U.S. Department of Energy, its laboratories, energy centers, and contractors, as well as theses and conference papers and proceedings issued by these organizations in report form. Audiovisual materials, computer media (magnetic tapes, diskettes, etc.), and engineering drawings are included in this definition. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations, *provided* that the full text of the document has been received by OSTI. Foreign report information is obtained through the International Energy Agency's 16-nation Energy Technology Data Exchange, the International Atomic Energy Agency's International Nuclear Information System, or nation-to-nation agreements. The purpose of this publication is to announce documents produced or obtained by DOE that are not so readily available as journal articles, books, or patents.

Scope

The scope of *ERA* encompasses DOE's research, development, demonstration, and technology programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

The citations presented in *ERA* are available for online searching as records within the Energy Science and Technology Database (EDB). The current-year records are available on the Integrated Technical Information System (ITIS).

Availability

DOE and DOE contractors can obtain *ERA* (regular issues and annual indexes) by using VISA, MasterCard, or OSTI deposit accounts. Contact the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information, call (615)576-8401. *ERA* is also available at authorized GPO Depository Libraries. (List is provided on the inside back cover.)

ERA (regular issues and annual indexes) is available to the public on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Managing Editor, Doris M. Henline
Technical Editor, Milton O. Whitson

Information Sources

The citations presented in *Energy Research Abstracts* are a subset of the worldwide energy information provided to the Office of Scientific and Technical Information (OSTI) through exchange agreements with foreign sources and through exchanges or contracts with U.S. organizations.

The **Energy Technology Data Exchange (ETDE)** was established by the International Energy Agency to promote cooperation among members in conducting appropriate energy-related research and development programs through the development of a formal central information sharing system. In accomplishing the objectives of the ETDE, members select, abstract, and index relevant research information published in their countries in accordance with Exchange standards. OSTI serves as the central receiving and processing center for this information, which it then disseminates to national centers in the participating countries. The following countries are currently members of the ETDE:

Canada	Poland
Denmark	Republic of Korea
Finland	Spain
France	Sweden
Germany	Switzerland
Italy	The Netherlands
Japan	United Kingdom
Norway	United States

The **International Nuclear Information System (INIS)** was established to promote the exchange of information on nuclear science and technology. Its operation is similar to that of the ETDE, with the INIS Secretariat being located in Vienna, Austria. Currently, 79 countries and 15 international organizations are members of INIS. OSTI serves as the INIS national center for the United States.

In the exercise of its rights and responsibilities under the agreements to which it is a party, the **Office of Scientific and Technical Information** both receives information from the above sources and submits U.S.-produced information to them. In addition to materials generated by the Department of Energy, this U.S.-produced information is gathered from other government agencies as well as under contract with private information processing companies. All input is computer processed and entered into a database for online retrieval. The database serves as well for the production of numerous OSTI publications.

How To Read A Citation

The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
5. **Author affiliation.** Only first one is listed, in parentheses after author(s) to which it applies.
6. **Collaboration,** if present.
7. **Corporate author(s)** identifying corporation responsible for document.
8. **Date of publication.** If not known, a processing date is in brackets.
9. **Number of pages** or page range. Prices are based on total pages unless special pricing applies.
10. **Language** of document if non-English.
11. **Monograph title** if citation is an analytic (part, chapter, or paper) of a larger monograph.
12. **Sponsoring organization.**
13. **Contract or grant number.**
14. **Secondary identifying number;** may be a conference number.
15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in $30m^2$ air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Order from the Availability Sources

TO OBTAIN A REPORT

Report literature, usually identified by an alphanumeric identifier at the beginning of a citation, is available from the sources listed in the citation (see example of element 2 on page iii). Often the sources are listed as abbreviations. Corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given, **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) OSTI prices are based on total pages unless special pricing applies. The public should order from NTIS or from one of the other agencies listed in the citation. NTIS price codes may continue to appear in some records. To expedite processing, an order form is provided in the back of this publication. NOTE: The order numbers provide quicker access for report ordering. Use the order number where possible.

GPO Superintendent of Documents
Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at Government Printing Office regional depository libraries.

INIS *Available only in microfiche.*
INIS Clearinghouse
International Atomic Energy Agency
P.O. Box 100, A-1400
Vienna, Austria

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

CASI Attention: Document Order
NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

How To Use the Indexes

Five indexes are provided for approaching the content of each issue of *Energy Research Abstracts*. Descriptions of entries in these indexes follow.

Corporate Author Index
The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index
Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index
This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index
DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index
Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is:

DOE/ER/40438–T1	15:18494	NTIS, OSTI	E 1.99: DE89007246	MF-411

Subject Contents

The subject content of *Energy Research Abstracts* is arranged as shown below. The two-digit and four-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level and the 313 second-level categories. Because each issue of *ERA* publishes citations only for those documents announced during the past semimonthly period, some subject categories may not be present in every issue.

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*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope.*

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Energy Research Abstracts

01 COAL, LIGNITE, AND PEAT

0103 Preparation

Refer also to citation(s) 11452, 11481, 11487, 11489, 11984, 11989, 12633

11404 (CONF-9309152–Vol.1, pp. 5-8) **Remarks of Deputy Secretary of Energy.** White, W. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

Think with me about this. In a sense, here we are in the very middle of a quiet and unsung economic revolution. We are in the very middle of it. Think about this. We are sitting right now the international economy growing and becoming integrated like it never has in the history of the planet. This will not be the last year that we have international delegations at this conference. They will grow. And when conferences are held abroad it will be Americans who will attend. That's because, as ideologies are swept aside, the common problems of economic growth and the practical problems of building the infrastructure needed to power that growth are things which we will share. That wasn't true 50 years ago, it wasn't true 100 years ago, it wasn't true 500 years ago. But it is true today.

11405 (CONF-9309152–Vol.1, pp. 29-37) **Regulatory climate for clean coal technology into the next century.** Shishido-Topel, L. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

CCT is of interest because it has the potential to use a very abundant fuel to meet environmental standards more efficiently than other means. Given the changing economic environment in the electric industry, CCT therefore should be viewed as a potential competitive strategy as well as a potential compliance strategy. The success of CCT will therefore depend in large part on how well CCT and the way it is developed will be able to adapt to the changing economic environment.

11406 (CONF-9309152–Vol.1, pp. 39-50) **A coal producer's perspective-clean coal technology program.** Kennedy, F. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

I have been given the task of presenting a coal producer's perspective to the Clean Coal Technology Program. Our luncheon speaker Mike Reilly, Chairman of National Coal Association, will cover the broad picture of coal as the fuel of choice and the fuel of necessity. I will limit my remarks of CONSOL's perspective of clean coal technology.

11407 (CONF-9309152–Vol.1, pp. 51-68) **Planting the CEED for success.** Paul, J. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

In 1944, over half of the American people heated their homes with coal. Even in the mid-to-late 1940s, coal was the favored heating source for most people relative to gas and oil. Coal was part of peoples' everyday lives. Sure, there were the negatives to using coal as with any fuel - people then and now think of air pollution scenes of Pittsburgh in the '40s – but people also knew, personally, the benefits of coal.

11408 (CONF-9309152–Vol.1, pp. 71-82) **CCT conference address.** Reilly, M.K. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

Coal is the fuel of choice and the fuel of necessity. The story of coal is that of a love-hate relationship that extends backwards many centuries. Coal has slowly but steadily carried the progress of entire civilizations on its shoulders. Yet while coal has often been the fuel of choice, it has rarely been accepted by the general public without reservations. Coal has been viewed not just as a fuel of necessity but as a necessary evil, something to get us through until we can find a truly good fuel. The advantages of using coal as an energy source are discussed.

11409 (CONF-9309152–Vol.1, pp. 85-92) **Evolution of domestic utility market structure into the 21st century.** Preston, G.T. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

My comments focus on the evolution of the United States domestic electric utility market structure and some of the implications of that evolution for clean coal technology markets. I'll briefly address: (1) recent and potential future changes in the electric utility industry; (2) projected U.S. electricity demand into the next century; (3) current and advanced coal-based electric generating technologies and their competition; and (4) the domestic market for CCT electricity generation.

11410 (CONF-9309152–Vol.1, pp. 97-99) **Talking points for clean coal conference-IPP perspective.** Iribe, P.C. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The following topics on clean coal technology are discussed: (1) background on IPP industry and US generating capacity; (2) market trends in coal combustion technologies; (3) clean coal technology commercialization issues; (4) what needs to be improved if clean coal technology commercialization can go forward; (5) potential market today - next 5-10 years; and (6) commercialization challenges.

11411 (CONF-9309152–Vol.1, pp. 101-110) **Foreign markets and a case study of international deployment of CCTs.** Naill, R. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The following topics are presented in outline form: World bank standards, how to get clean coal into foreign markets, world power markets, environmental performance of coal options, country credit risk, IPP potential market size, government actions encouraging IPP development, cost of SO_2 removal, and cost of clean coal vs conventional coal options.

11412 (CONF-9309152–Vol.1, pp. 111-123) **A case study: The commerical deployment of pure air's clean coal technology.** Ashline, P.M. (Pure Air, Allentown, PA (United States)). Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

Northern Indiana Public Service Company (NIPSCO) has chosen an unique approach to comply with air quality regulations at its Bailly Generating Station. The utility has entered into a 20-year agreement with Pure Air to design, engineer, construct, fabricate, own, operate, maintain and finance the FGD project. Pure Air, a general partnership company between Air Products and Chemicals, Inc. and Mitsubishi Heavy Industries America, Inc., was selected by the U.S. Department of Energy (DOE) under the Clean Coal Technology Demonstration Program to install an advanced co-current, wet flue gas desulfurization (FGD) system at the Bailly Generating Station. The project combines the most advanced features of Mitsubishi's 95+ units worldwide (over 27,000 MW installed) and an innovative commercial arrangement into a single project to demonstrate substantially lower capital and operation costs when compared to conventional FGD designs. This paper briefly discussed the progress and performance of the project to date and then describes Pure Air's deployment strategy for this technology.

11413 (DOE/MC/30097–3626) **Task 4.0 – Advanced fuel forms and co-products: Semi-Annual report, April 1–June 30, 1993.** Anderson, C.M.; Musich, M.A.; Young, B.C.; Timpe, R.C.; Olson, E.S.; Sharma, R.K. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Jul 1993. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30097. Order Number DE94000095. Source: OSTI; NTIS; GPO Dep.

Summarized below is the work carried out over a six-month period on the subtasks Beneficiation for Advanced Systems, Co-Products, and Low-Rank Coal Liquefaction. Hydrothermal drying (hot-water drying and saturated-steam drying) was determined to be an effective method of causing a permanent reduction in the equilibrium moisture of low-rank coals and removing sodium. The development of improved methods is continuing for assessing the propensity of coals to dust generation. Carbonic acid treatment of lignites and subbituminous coals reduced the sodium contents of these coals by 60 to 70 wt%. Float/sink washability testing of low-sulfur subbituminous coals produced ash reductions of 30 to 40 wt% at +95 wt% moisture and ash-free (maf) coal recovery. Ineffective agglomerants were induced to agglomerate low-rank coals by mixing with a polar oil or polar alcohol. Effective agglomeration promoters were crude phenol, m-cresol, cresylic acid, methanol, ethanol, propanol, and butanol. Three coals, a North Dakota Lignite, a North Dakota Leonardite, and an Alaskan subbituminous coal, were pyrolyzed. Proximate analysis showed that the subbituminous char was typically lower in volatiles than the lignite. Adsorption of sulfur dioxide by the chars were indistinguishable from one another. Coal can be effectively solubilized by treatment with CO reductant in an aqueous solvent (CO steam process). In this report, the catalytic hydrotreatment of the solubilized low-severity products from sodium aluminate-catalyzed and uncatalyzed CO/H_2O reactions of a Wyodak subbituminous coal are compared. Liquefaction with the Co-Mo catalyst gave 68% conversion to heptane solubles for both the sodium aluminate and the uncatalyzed low-severity reaction intermediates.

11414 (DOE/PC/91290–T8) **Non-intrusive measurement of particle charge: Electrostatic dry coal cleaning: Technical progress report #9, July 1, 1993-September 30, 1993.** Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research. [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91290. Order Number DE94008374. Source: OSTI; NTIS; GPO Dep.

During the period covered by this report, data quantifying the effect of gas temperature on particle charge were collected. Also, the charging loop current surges, described in the last report, were further investigated and an understanding of their origin has been developed. A new method for determining average particle charge was developed which monitors the current flow from an electrolytic solution as the charged particles are immersed. This report briefly summarizes progress on this project in Task 1 (Sample Acquisition and Preparation), Task 2 (PDPA–Charge Measurement), and Task 4 (Reports/Publications).

11415 (DOE/PC/92207–T4-Vol.1) **Bench-scale testing of on-line control of column flotation using a novel analyzer: Revised final report, [October 1992–October 1993]: Volume 1.** Process Technology, Inc., Calumet, MI (United States). 27 Oct 1993. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92207. Order Number DE94005683. Source: OSTI; NTIS; GPO Dep.

The main advantage of the project is that it allowed PTI to gain knowledge and experience about the proper approach, methods and hardware required to properly optimize and control column flotation performance. Many operational problems were incurred during the project, some of that PTI was able to solve during the project and other that must be overcome as the technology is further developed and commercialized. The key operating problems experienced with the KEN-FLOTE™ Column that must be further researched and overcome include: (1)The low concentrate solids content which limited the throughput capacity of the column, due to high froth washing requirements. The low concentrate solids content also lead to difficulty obtaining accurate On-Line Monitor measurements, due to the poor measurement sensitivity obtained with low solids content samples (particularly less than 5.0 wt %). (2) The higher-than-anticipated reagent dosages that undoubtedly contributed to the low solids content listed above, and also caused foaming problems within PTI's On-Line Monitor. A defoaming reagent addition (Nalco 7810) was required to provide consistent sample size and reproducible On-Line Monitor counts for the concentrate samples collected within the circuit. PTI and UK's CAER staff will continue to research alternative column design, particularly alternative air bubble generation and air distribution systems, to try to maximize column concentrate solids content while reducing reagent dosage requirements. In addition to the KEN-FLOTE™ Column operation there were also a number of hardware problems with PTI's On-Line Quality Monitor that must be remedied for future commercial installations.

11416 (DOE/PC/92521–T92) **Carbonation as a binding mechanism for coal/calcium hydroxide pellets: Final technical report, 1 September, 1992–31 August, 1993.** Rapp, D. (Illinois State Geological Survey, Champaign, IL (United States)); Lytle, J.; Hackley, K.; Dagamac, M.; Berger, R.; Schanche, G. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008034. Source: OSTI; NTIS; GPO Dep.

This research was an investigation of calcium hydroxide, a sulfur-capturing sorbent, as a binder for coal fines. The reaction of carbon dioxide with calcium hydroxide, referred to as carbonation, was studied as a method for improving pellet quality. Carbonation forms a cementitious matrix of calcium carbonate. Research has demonstrated that calcium hydroxide is a viable binder for coal fines and that a roller-and-die pellet mill is an effective method of pellet formation. From a minus 28 mesh preparation plant fine coal sample, a roller-and-die pellet mill produced strong pellets when 5 and 10% calcium hydroxide was used as a binder. The pellets containing 10% calcium hydroxide strengthened considerably when air cured. This increase in strength was attributed to carbonation via atmospheric carbon dioxide. Pellets containing 10 wt% calcium hydroxide were produced using an extruder but pellets formed in this manner were much weaker than pellets produced with the roller-and-die mill. In tests performed using a laboratory hydraulic press, the effect of particle size and compaction pressure on pellet strength was studied. Particle distributions with mean sizes of 200, 90 and 40 microns were tested. The results indicate that pellet strength increased with decreasing particle size and increasing compaction pressure when calcium hydroxide was used as a binder. Pellets containing 10 wt% calcium hydroxide increased in strength by approximately 40% when air dried for one day. As above, this increase in strength was attributed to carbonation of the calcium hydroxide via atmospheric carbon dioxide.

11417 (DOE/PC/93203–T1) **Electrostatic beneficiation of coal: Quarterly technical progress report, October 1, 1993–December 31, 1993.** Mazumder, M.K.; Lindquist, D.; Tennal, K.B. Arkansas Univ., Little Rock, AR (United States). 26 Jan 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93203. Order Number DE94008178. Source: OSTI; NTIS; GPO Dep.

Literature review: (1) Literature searches were performed. We are continuing to organize and review those documents which we have obtained. We are examining software packages for use in determining electric fields for different electrode configurations. (2) We have obtained one such program on a 30 day trial. It handles both DC and AC fields and can determine particle trajectories for certain conditions. The primary importance of electric field modeling will be in the design of the electric curtain for repelling particles from the walls of the separator. (3) Computer and camera requirements for making particle size and charge measurements using image processing have been determined and suitable commercial instruments have been identified. (4) A draft of the experimental design for the first section (Tribocharging of Coal Powders) of the project has been assembled and is included as Appendix B of this report.

11418 (KTM/E-B–158) **ADEWA - Artificial dewatering of peat: Final report on the energy research programme 1988-1992.** Pirkonen, P. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.). Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. 1993. 130p. (In Finnish). Project KTM-356/881/86. Order Number DE94721998. Source: OSTI; NTIS.

ADEWA Research Programme.

A peat production method (SLURRY-COMP) based on artificial dewatering was developed according to the aims of the research programme. The most important subgoal was to obtain dry solid content of 35 % in mechanical dewatering. A peat layer of 0.3-0.4 m is milled annually from the field surface prepared almost conventionally in the best variation of the process (MSLURRY-COMP). Peat is transferred immediately after milling to the stockpile by the modified ridge transferring method. Devices 'eating' the stockpile make the peat slurry and pump it to the collection basins where it is pumped to the winter storage pond located close to the power plant. The slurry is pumped from the pond through pretreatment to the dewatering phase. Production of moister milled peat than usual with the surface scraping method and slurry production with the excavation/slurring device mounted on a barge was studied for the supplying of peat. The studies of slurry pumping were carried out mainly with the pilot-scale line installed in the laboratory and to some extent in connection with the excavating/slurring experiments on the bog. The aim was to study especially the joints affecting long distance pumping. The viscosity of slurry and the flowing properties of pasty peat were measured. The water binding properties of peat were studied widely. Moderate heating and heating (>100 deg C) improved essentially the dewatering process, but sieving did not. Wet milled peat gave the best dewatering results. The effects of the electric/acoustic field could not be demonstrated in the compression of peat. A cheap method for the chemical pretreatment of Carex peat was found. The dewatering results were verified with small scale commercial dewatering devices

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Refer also to citation(s) 11413, 11467, 11468, 11469, 11483, 11500, 11513, 11892, 11919, 11982, 11983, 11984, 11985, 11986, 11988, 11996, 11997, 11998, 11999, 12001, 12026, 12035, 12036, 12061, 12062, 12063, 12064, 12065, 12066, 12067, 12068, 12069, 12070, 12071, 12072, 12073, 12074, 12075, 12076, 12077, 12078, 12079, 12080, 12081, 12082, 12083, 12084, 12085, 12086, 12087, 12088, 12089, 12091, 12092, 12093, 12094, 12095, 12096, 12634, 12676, 12677

11419 (ANL/CHM/CP–81245) **Changes in organic sulfur compounds in coal macerals during liquefaction.** Winans, R.E. (Argonne National Lab., IL (United States)); Joseph, J.T.; Fisher, R.B. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–12: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006819. Source: OSTI; NTIS; GPO Dep.

Several general trends were observed in reactivity patterns of sulfur compounds in macerals. Sulfur is reduced in the asphaltene fraction compared to initial maceral. Aliphatics are removed and polycyclic aromatic compounds are both stable and probably formed under these conditions. Molecules containing two sulfur atoms are formed. The preasphaltenes are now being analyzed by DEIHRMS.

11420 (CONF-9309152–Vol.1, pp. 423-448) **Status of the demonstration of pulse combustion in steam gasification.** Durai-Swamy, K.; Mansour, M.N.; Sid, H.; Steedman, W.G. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

ThermoChem's Clean Coal Technology project is a unique gasification process that uses indirect heating by combustion tubes immersed in a fluidized bed producing medium-Btu gas without needing an oxygen plant. The concept of using pulse combustion tubes as an indirect heat source was developed by Manufacturing Technology Conversion International, Inc. (MTCI), who have licensed the technology to ThermoChem. MTCI has completed a successful field testing of the pulse indirect heater (72-tube bundle) in a pulp and paper mill sludge/rejects gasification. After the project was selected under the Clean Coal Fourth round, ThermoChem requested DOE to move the project to the Caballo Rojo Coal mine site in Gillette, Wyoming to supply gas and steam for "K-Fuel," coal-upgrading plant. The ThermoChem gasifier can not only use K-Fuel wastewater and off-gas, but it can gasify the fine coal that is not marketable or usable by the K-Fuel plant. A preliminary test using K-Fuel effluent water and Caballo Rojo Coal fines was done in 1992 in MTCI's laboratory-scale gasifier facility in Santa Fe Springs, California at 20 lb/hr. This test showed that the organics in the K-Fuel effluent could be destroyed in the MTCI gasifier. Further testing in a larger facility (1,000 lb/hr) at Baltimore, Maryland is being planned for design verification of the process chemistry. A 252-tube bundle will be built and tested as part of the design verification in 1993.

11421 (DOE/FTR–94004633) **Trip to Japan to participate in the Eighth Coordinating Committee Meeting in Coal Energy Research and Development: Foreign trip report, October 12, 1993.** Chun, Sun W. USDOE Pittsburgh Energy Technology Center, PA (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94004633. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This trip report summarizing the activities of the US delegation at the subject meeting held in Japan, October 12, 1993. Details of the fifth Ministry of International Trade and Industry-Agency of Natural Resources and Energy/Department of Energy-Pittsburgh Energy Technology Center Joint Technical Meeting, technical discussions at the Tokyo Institute of Technology, and site visits at three pollution control projects are also included.

11422 (DOE/MC/24021–3544) **Subpilot scale gasifier evaluation of ceramic cross flow filter: Final report, February 1, 1988–December 31, 1992.** Lippert, T.E.; Alvin, M.A.; Smeltzer, E.E.; Bachovchin, D.M.; Meyer, J.H. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. Aug 1993. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC24021. Order Number DE94000069. Source: OSTI; NTIS; GPO Dep.

The operating characteristics, performance and durability of a hot gas cross flow filter system were evaluated at the Texaco 15 tpd, entrained-bed gasifier pilot plant facility that is located at their Montebello Research Facilities (MRL) in California. A candle filter unit was also tested for comparative purposes. A wide range of operating test conditions were experienced. This report summarizes the results of eleven different test runs that occurred from April 1989 through August 1992. Differences between filter operation on the entrained gasifier and prior experience on fluid bed combustion are discussed.

11423 (DOE/MC/24116–94/C0282) **Development of an advanced, continuous mild gasification process for the production of co-products.** Wright, R.E.; Wolfe, R.A.; Im, C.J.; Henkelman, M.R.; O'Neal, G.W.; McKinney, D.A. Coal Technology Corp., Bristol, VA (United States). [1993]. 15p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC21-87MC24116. (CONF-931156–26: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007306. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to develop a continuous mild gasification process to convert highly caking coals to coal liquids, char and coke for near term commercial application. Coal liquids after fractionation can be blended with petroleum and used interchangeably with conventional fuels without modifications in gasoline and diesel engines. Char can be used as a carbon source in the production of ferroalloys and in mini-mills. Coke can be produced by upgrading char through briquetting and calcining and for use in the steel industry foundries and blast furnaces. In a step beyond the scope of the project, the plan is to finance, design and construct, in a partnership with others, a plant to produce coal liquid, char and coke in the initial range of 250,000 tons/year. In the Coal Technology Corporation CTC/CLC® Process, coal is continuously moved by interfolded twin screws through a heated retort in the absence of air. The residence time of the coal in the Continuous Mild Gasification Unit (CMGU) is in the range of 20–30 minutes. The coal is heated to controlled temperatures between 800° and 1400°F and is converted into char, condensible hydrocarbon liquids, small quantities of water, and non-condensible fuel gases. The coal derived fuel gases could supply all the required process heat, but for convenience, natural gas is used in the experimental unit. The process concept particularly suitable for highly caking coals which cannot be processed in fluidized bed or moving bed furnaces.

11424 (DOE/MC/24116–3632) **Development of an advanced, continuous mild gasification process for the production of co-products: Quarterly report, July–September 1993.** O'Neal, G.W. Coal Technology Corp., Bristol, VA (United States). Dec 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24116. Order Number DE94004051. Source: OSTI; NTIS; GPO Dep.

It is important that a mild gasification reactor interface easily with the subsequent product upgrading steps in which the market value of the products is enhanced. Upgrading and marketing of the char are critical to the overall economics of a mild gasification plant because char is the major product (65 to 75% of the coal feedstock). In the past, the char product was sold as a "smokeless" fuel, but in today's competitive markets the best price for char as a fuel for steam generation would be that of the parent coal. Substantially higher prices could be obtained for char upgraded into products such as metallurgical coke, graphite, carbon electrode feedstock or a slurry fuel replacement for No. 6 fuel oil. In this effort, upgrading techniques are being developed to address these premium markets. Liquid products can similarly be upgraded to high market value products such as high-density fuel, chemicals, binders for form coke, and also gasoline and diesel blending stocks. About half of the non-condensable fuel gases produced by the gasification process will be required to operate the process; the unused portion could be upgraded into value-added products or used as fuel either internally or in "across the fence" sales. The primary objective of this project is to develop an advanced continuous mild gasification process and product upgrading processes which will be capable of eventual commercialization.

11425 (DOE/MC/26308–3637) **CE IGCC repowering project preliminary hazard analysis: Topical report, November 1, 1990–May 31, 1993.** Peletz, L.J. Combustion Engineering, Inc., Windsor, CT (United States). Jun 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004056. Source: OSTI; NTIS; GPO Dep.

A preliminary hazard analysis was conducted on the CE IGCC unit by representatives from ABB Lummus Crest Process Systems, Lummus Technical Division, Combustion Engineering, and Lummus Initial Operations. As a basis for the review, available technical data and documentation was used. Two areas of the unit were reviewed, the coal yard delivery system and the gasifier island. The coal yard consists of the coal delivery and handling systems, both of these systems are conventional. The gasifier island encompasses the coal pulverizer and feed system, gasifier and syngas cooler, char removal system, char recycle system, and high temperature sulfur removal system. With first of a kind equipment incorporated in the gasifier island, most of the concerns of potential hazards were centered here. At the time of the review, there were no process flow diagrams for the rest of the combined cycle. To prevent detaining the review of the gasifier island, the remaining areas were not reviewed at this time. However, the remaining areas will be reviewed before final unit design is completed. In reviewing the above mentioned systems, the PHA identified several hazards which will be the basis for a subsequent detailed Hazard and Operability (HAZOP) study which will be performed at a later stage of this project. Results from the evaluation were documented by the team and then reviewed by engineers in the IGCC Product Development department. From the concerns of risks developed by the review team, rethinking of proposed operation and design of the plant during the preliminary design stages took place. (In doing so, cost and redesign time during final design phase will be reduced).

11426 (DOE/MC/26308–3639) **CE IGCC Repowering Project char filters: Topical report, November 1990–May 1993.** Krawczyk, P.D. ABB/Combustion Engineering, Inc., Windsor, CT (United States). May 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004060. Source: OSTI; NTIS; GPO Dep.

The char filters are required to operate at 1000 degrees at a nominal internal pressure range of 256 to 294 psia. In the design used for estimating the demonstration plant, product gas and entrained char leave the gasifier heat exchanger at 1000°F and enter a char cyclone that separates a nominal 65% of the char from the product gas. The product gas and remaining char discharge the cyclone to two parallel char filters each sized to handle 50% of the gas and char load. The char filters resemble conventional cylindrical bag filter modules use for gas filtration. The 12-ft. diameter vessels are constructed of carbon steel with insulating refractory linings. The refractory in the cones is lined with stainless steel to promote flow. The filters are designed to use any of three different high temperature filter media. Each type of filter is available in common diameters, and the tube sheet is arranged for a single filter diameter. The tube sheet is designed to accommodate movement and stress due to thermal expansion and differential pressure excursions.

11427 (DOE/MC/26308–3640) **CE IGCC Repowering plant sulfuric acid plant: Topical report, June 1993.** Chester, A.M. Combustion Engineering, Inc., Windsor, CT (United States). Dec 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004061. Source: OSTI; NTIS; GPO Dep.

A goal of the CE IGCC Repowering project is to demonstrate a hot gas clean-up system (HGCU), for the removal of sulfur from the product gas stream exiting the gasifier island. Combustion Engineering, Inc. (ABB CE) intends to use a HGCU developed by General Electric Environmental Services (GEESI). The original design of this system called for the installation of the HGCU, with a conventional cold gas clean-up system included as a full-load operational back-up. Each of these systems removes sulfur compounds and converts them into an acid off-gas. This report deals with the investigation of equipment to treat this off-gas, recovering these sulfur compounds as elemental sulfur, sulfuric acid or some other form. ABB CE contracted ABB Lummus Crest Inc. (ABB LCI) to perform an engineering evaluation to compare several such process options. This study concluded that the installation of a sulfuric acid plant represented the best option from both a technical and economic point of view. Based on this evaluation, ABB CE specified that a sulfuric acid plant be installed to remove sulfur from off-gas exiling the gas clean-up system. ABB LCI prepared a request for quotation (RFQ) for the construction of a sulfuric acid production plant. Monsanto Enviro-Chem Inc. presented the only proposal, and was eventually selected as the EPC contractor for this system.

11428 (DOE/MC/27391–94/C0283) **Value-added co-products from K-M/IGT facility.** Campbell, J.A.L.; Carty, R.H.; Foster, H. Kerr-McGee Coal Corp., Oklahoma City, OK (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract FC21-92MC27391. (CONF-931156–30: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007307. Source: OSTI; NTIS; GPO Dep.

Objective is to develop the IGT MILDGAS (a continuous coal carbonization process for producing liquid and solid (char) coproducts at mild operating conditions up to 50 psig and 1300 F) technology for near-term commercialization. Specifically, a 24- ton/day adiabatic process development unit (PDU) is to be constructed. Status of the schedule for constructing the PDU at Southern Illinois University, Carbondale, is given.

11429 (DOE/MC/29246–3616) **Hot Coal Gas Desulfurization with manganese based sorbents: Quarterly report, August 1, 1993–September 30, 1993.** Hepworth, M.T. Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering. Oct 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29246. Order Number DE94004057. Source: OSTI; NTIS; GPO Dep.

The focus of work being performed on Hot Coal Gas Desulfurization at the Morgantown Energy Technology Center is primarily in the use of zinc ferrite and zinc titanate sorbents; however, prior studies at the US Steel Fundamental Research Laboratories in Monroeville, PA, by E. T. Turkdogan indicated that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt % ore + 25 wt % Al_2O_3) may be a viable alternative to zinc-based sorbents. Manganese, for example, has a lower vapor pressure in the elemental state than zinc hence it is not as likely to undergo depletion from the sorbent surface upon loading and regeneration cycles. Also manganese oxide is less readily reduced to the elemental state than iron hence the range of reduction potentials for oxygen is somewhat greater than for zinc ferrite. In addition, thermodynamic analysis of the manganese-oxygen-sulfur system shows it to be less amenable to sulfation than zinc ferrite. Potential also exists for utilization of manganese at higher temperatures than zinc ferrite or zinc titanate. This report documents progress in pelletizing and testing via thermogravimetric analysis of individual pellet formulations of manganese ore/alumina combinations and also manganese carbonate/alumina with two binders, dextrin and bentonite. Preliminary results indicate that the manganese carbonate material, being of higher purity than the manganese ore, has a higher degree of sulfur capacity and more rapid absorption kinetics. A 2-inch fixed-bed reactor has been fabricated and is now ready for subjecting pellets to cyclic loading and regeneration.

11430 (DOE/PC/88801–T5) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, September 26, 1989–December 26, 1989.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1989]. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008141. Source: OSTI; NTIS; GPO Dep.

To gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11431 (DOE/PC/88801–T6) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, December 26, 1989–March 26, 1990.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1990]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008142. Source: OSTI; NTIS; GPO Dep.

To gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11432 (DOE/PC/88801–T7) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, March 27, 1990–June 26, 1990.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1990]. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008143. Source: OSTI; NTIS; GPO Dep.

To gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11433 (DOE/PC/88801–T8) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, September 27, 1990–December 26, 1990.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1990]. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008144. Source: OSTI; NTIS; GPO Dep.

The objective is to gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11434 (DOE/PC/88801–T9) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, December 27, 1990–March 26, 1991.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1991]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008145. Source: OSTI; NTIS; GPO Dep.

The objective is to gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11435 (DOE/PC/88801–T10) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, March 27, 1991–June 26, 1991.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1991]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008146. Source: OSTI; NTIS; GPO Dep.

The objective is to gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11436 (DOE/PC/88801–T11) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, June 27, 1991–September 26, 1991.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1991]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008147. Source: OSTI; NTIS; GPO Dep.

The objective is to gain a fundamental understanding of the role and importance of hydrogen transfer reactions in thermal and catalytic coprocessing by examining possible hydrogen donation from cycloalkane/aromatic systems and by understanding the chemistry and enhanced reactivity of hydrotreated residuum, as well as by enriching petroleum solvent with potent new donors, nonaromatic hydroaromatics, thereby promoting hydrogen transfer reactions in coprocessing. The detailed results of experiments performed on several subtasks during the quarter are presented.

11437 (DOE/PC/88801–T12) **Coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, September 26, 1991–December 26, 1991.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1991]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008148. Source: OSTI; NTIS; GPO Dep.

The research conducted during this quarter evaluated hydrogen transfer from hydroaromatics and cyclic olefins to aromatics under thermal and catalytic conditions. The reactions under study involved thermal reactions of a cyclic olefin, isotetralin (ISO), with aromatics, anthracene (ANT) and pyrene (PYR). These reactions completed a set of experiments with hydrogen-rich species and aromatics previously reported that included cycloalkanes of perhydropyrene (PHP) and perhydroanthracene (PHA), hydroaromatic donors, tetralin (TET) and dihydroanthracene (DHA), cyclic olefins, hexahydroanthracene (HHA) and ISO, and aromatics, PYR and ANT. Catalytic reactions performed this quarter used a sulfur catalyst that had been shown by Rudnick to affect the hydrogen transfer from cycloalkanes to aromatics and/or coal. Rudnick investigated the dehydrogenation of alicyclic compounds converting them to the corresponding aromatic compounds in a process in which the alicyclic compounds served as hydrogen donors. Thiophenol and thiol were effective catalysts and helped promote the conversion of alicyclic compounds to aromatic compounds. The research performed in our laboratory focused on evaluating the effect of a sulfur catalyst on the transfer of hydrogen from cycloalkanes like perhydropyrene (PHP) to aromatics like anthracene under catalytic conditions. The catalyst used in this study was sulfur generated from thiophenol present at a concentration level of 2000 ppm of sulfur. The reactions were performed under two temperature conditions, 380 and 440°C; both thermal and catalytic reactions were performed for comparison. In addition, the individual cycloalkane and aromatic compounds were reacted under these conditions so that a direct comparison of the effect of temperature and of catalyst on the reaction products formed could be made.

11438 (DOE/PC/88801–T13) **Coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, December 27, 1991–March 27, 1992.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1992]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008149. Source: OSTI; NTIS; GPO Dep.

The research conducted this quarter evaluated hydrogen transfer from resids reduced using the Birch reduction method and their corresponding parent resid to an aromatic acceptor, anthracene (ANT). The reactions involved thermal and catalytic reactions using sulfur introduced as thiophenol. This catalyst has been shown by Rudnick to affect the hydrogen transfer from cycloalkane to aromatics/or coal. The purpose of this current study was to evaluate the efficacy of hydrogen transfer from the hydrogen-enriched reduced resid to an aromatic species and to compare that to the hydrogen transfer from the original resid. The analyses performed to evaluate hydrogen transfer were the determination of product slates from the hydrogenation of ANT and the fractionation of the resid into solubility fractions after reaction with ANT. The amount of coal conversion to THF solubles was higher in the coprocessing reactions with the reduced resids compared to the reactions with the corresponding untreated resid. The reduction of the resids by the Birch method increased the hydrogen donating ability of the resid to the same level as that obtained with the introduction of isotetralin (ISO) to the original resid. The ISO was introduced at a level of 0.5 wt % donable hydrogen. Both the original resids and the resids reduced by the Birch method were reacted in the presence of an aromatic species, anthracene (ANT). These reactions were performed under both nitrogen and hydrogen atmospheres at a pressure of 1250 psig introduced at ambient temperature. The reactions were performed both thermally and catalytically at 380°C for 30 minutes. The catalyst used was thiophenol which is the same catalyst as has been used in the previously reported model compound studies involving hydrogen transfer from cycloalkanes to aromatics.

11439 (DOE/PC/88801–T14) **Coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Quarterly report, March 28, 1992–June 30, 1992.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1992]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008150. Source: OSTI; NTIS; GPO Dep.

Hydrogen transfer from naphthenes to aromatics, coal, resid, and coal plus resid has been investigated at 430°C in a N_2 atmosphere. The reaction of perhydropyrene (PHP) with anthracene (ANT) resulted in the formation of pyrene (PYR) and dihydroanthracene. The weight percents of the products formed varied according to the initial ratio of ANT/PHP with a minimum appearing at a 2:1 weight ratio. Increased reaction times and high ANT/PHP ratios also yielded tetrahydroanthracene (THA). Reactions of Illinois No. 6 coal from the Argonne Premium Coal Sample Bank with PHP, ANT, and PYR resulted in higher coal conversion with PHP and lower with ANT and PYR. Reactions of PHP with resid resulted in less retrogressive reactions occurring in the resid than with either PYR or ANT. Apparent hydrogen transfer from coal or resid to ANT and PYR was observed. Combining PHP with ANT or PYR with coal, resid or coal plus resid yielded higher conversions and less retrogressive reactions. Hydrogen transfer occurred from PHP to ANT or PYR and to the coal and resid as evinced by the increased conversion.

11440 (DOE/PC/88801–T15) **Improved performance in coprocessing through fundamental and mechanistic studies in hydrogen transfer and catalysis: Final report, September 26, 1989–March 31, 1993.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1993]. 265p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88801. Order Number DE94008151. Source: OSTI; NTIS; GPO Dep.

The key results obtained from this research project are given: (1) Hydrogen transfer from naphthenes to aromatics, coal and resid occurred at coprocessing temperatures and in a N_2 atmosphere; (2) Hydrogen donors ranked in reactivity as cyclic olefins (nonaromatic hydroaromatic compounds) > hydroaromatic compounds > naphthenes. This ranking held regardless of the type of atmosphere, hydrogen or nitrogen, used; (3) Resids reduced by the Birch method transferred substantially more hydrogen to the aromatic acceptor than did the parent resids under coprocessing conditions; (4) Hydropretreatment of resids resulted in enhanced coal conversion compared to the parent resid; (5) Addition of hydrogen donors such as cyclic olefins or hydroaromatic donors increased the amount of coal conversion during coprocessing. Cyclic olefins and the active hydroaromatic donor, dihydroanthracene, showed the highest level of hydrogen donability. Tetralin and octahydroanthracene showed low reactivity; (6) Reduced resids were more effective in coprocessing than the parent resids, in terms of enhanced coal conversion; (7) Thermal and catalytic reactivity of cyclic olefins under nitrogen and hydrogen atmospheres was much higher than conventional hydroaromatic donors when no aromatic acceptor was present; (8) Reactivity of hydrogen donors was dependent upon the reactivity of the acceptor as well as that of the donors; (9) Three-ring hydrogen donors, dihydroanthracene and

hexahydroanthracene, were most effective for transferring hydrogen to the Argonne coals while octahydroanthracene was the least reactive; (10) The kinetics data obtained for thermal and catalytic reactions involving cyclic olefins and hydroaromatic donors were adequately modeled by pseudo-first order kinetics; and (11) ΔG values calculated for cyclic olefins and hydroaromatic donors based on kinetics data adequately represented the reactivity observed experimentally.

11441 (DOE/PC/89783–T9) **Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, April 1, 1991–June 30, 1991.** Watson, P.R. Oregon State Univ., Corvallis, OR (United States). 24 Jun 1991. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89783. Order Number DE94008173. Source: OSTI; NTIS; GPO Dep.

This project revolves around understanding the fundamental processes involved in the catalytic removal of harmful oxygenated organics present in coal liquids. We are modelling the complex type of sulfided Mo catalyst proposed for these reactions with simple single crystal surfaces. These display a controlled range and number of reaction sites and can be extensively characterized by surface science techniques. We then investigate the reaction pathways for representative simple oxygenates upon these surfaces. In order to better understand the nature of the active surface in these experiments we have recorded low energy diffraction (LEED) data from the p(2 x 2) structure formed by sulfur on Mo(110). We have compiled a large number of intensity-voltage (IV) curves and have started the process of solving the surface structure using the new Tensor LEED method. Our previous work has shown that an important component of furan reactions on sulfided Mo surfaces are dehydrogenation reactions of adsorbed hydrocarbon fragments. The desorption of hydrogen occurs in several steps and is strongly influenced by the amounts of sulfur and carbon on the surface. In order to understand this complex behavior during this period we commenced a series of adsorption/desorption experiments for hydrogen (deuterium) on Mo(110). These experiments will be performed on both the clean surface and surfaces that have been prepared with varying amounts of carbon and sulfur on the surface.

11442 (DOE/PC/89783–T10) **Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, January 1, 1992–March 31, 1992.** Watson, P.R. Oregon State Univ., Corvallis, OR (United States). 23 Apr 1992. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89783. Order Number DE94008174. Source: OSTI; NTIS; GPO Dep.

This project revolves around understanding the fundamental processes involved in the catalytic removal of harmful oxygenated organics present in coal liquids. We are modelling the complex type of sulfided Mo catalyst proposed for these reactions with simple single crystal surfaces. These display a controlled range and number of reaction sites and can be extensively characterized by surface science techniques. We then investigate the reaction pathways for representative simple oxygenates upon these surfaces. We have made considerable progress in characterizing the adsorption site of sulfur on the Mo(110) surface. The sulfur is probably located in the quasi-fourfold center hollow site on the surface at a vertical distance of about 1.5Å above the topmost metal layer. At present the calculations assume no reconstruction of the metal layer and this tentative finding may change when we allow the metal to reconstruct. We have also progressed in our understanding of the reactions of furan on these surfaces. The data is therefore consistent with propane adsorption being hindered relative to either ethylene or furan, but the release of hydrogen from adsorbed furan is a higher energy process than the equivalent process for a simple hydrocarbon. The effect of preadsorbed S on furan and hydrocarbon adsorption is consistent with an adsorption site blocking role.

11443 (DOE/PC/89783–T11) **Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, April 1, 1992–June 30, 1992.** Watson, P.R. Oregon State Univ., Corvallis, OR (United States). 22 Jun 1992. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89783. Order Number DE94008175. Source: OSTI; NTIS; GPO Dep.

This project revolves around understanding the fundamental processes involved in the catalytic removal of harmful oxygenated organics present in coal liquids. We are modelling the complex type of sulfided Mo catalyst proposed for these reactions with simple single crystal surfaces. These display a controlled range and number of reaction sites and can be extensively characterized by surface science techniques. We then investigate the reaction pathways for representative simple oxygenates upon these surfaces. We have successfully solved the structure of Mo(110) p(2 x 2)-S structure and found the S atom to reside very close to the center-hollow site of a laterally-distorted first Moo layer. Some small vertical distortions in the top two Mo layers are also present. Preliminary results from experiments carried out with substituted furans indicate that the pattern of reaction is very similar to that of furan itself. The most significant change appears to that substitution beyond the mono stage results in substantial blocking of the adsorption process.

11444 (DOE/PC/89883–77) **Coal liquefaction process streams characterization and evaluation: Quarterly technical progress report, January 1–March 31, 1993.** Robbins, G.A.; Brandes, S.D.; Winschel, R.A.; Burke, F.P. CONSOL, Inc., Library, PA (United States). Dec 1993. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89PC89883. Order Number DE94008304. Source: OSTI; NTIS; GPO Dep.

Process oil samples from HRI Catalytic Two-Stage Liquefaction (CTSL) Bench Unit Run CC-16 (227-76) were analyzed to provide information on process performance. Run CC-16 was operated in December 1992 with Burning Star 2 Mine (Illinois 6 seam) coal to test and validate Akzo EXP-AO-60 Ni/Mo catalyst (1/16 in. extrudate). Results were compared with those of four previous HRI CTSL bench unit runs made with Ni/Mo catalysts. Major conclusions from this work are summarized. (1) Akzo EXP-AO-60 gave process oil characteristics in Run CC-16 similar to those of other Ni/Mo catalysts tested in Runs I-13, I-16, I-17, and I-18 (by our analytical and empirical test methods). No distinct performance advantage for any of the catalysts emerges from the process oil characteristics and plant performance. Thus, for commercial coal liquefaction, a number of equivalent catalysts are available from competitive commercial sources. The similarity of run performance and process oil characteristics indicates consistent performance of HRI's bench unit operations over a period of several years; (2) Dominant effects on process oil properties in Run CC-16 were catalyst age and higher temperature operation in Periods 10–13 (Condition 2). Properties affected were the aromaticities and phenolic -OH concentrations of most streams and the asphaltene and preasphaltene concentrations of the pressure-filter liquid (PFL) 850°F+ resid. The trends reflect decreasing hydrogenation and defunctionalization of the process streams with increasing catalyst age. Operation at higher temperature conditions seems to have partially offset the effects of catalyst age.

11445 (DOE/PC/91034–T6) **The economical production of alcohol fuels from coal-derived synthesis gas: Quarterly technical progress report Number 8, 1 July, 1993–30 September, 1993.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91034. Order Number DE94008007. Source: OSTI; NTIS; GPO Dep.

Task 1, the preparation of catalyst materials, is proceeding actively. At WVU, catalysts based on Mo are being prepared using a variety of approaches to alter the oxidation state and environment of the Mo. At UCC and P, copper-based zinc chromite spinel catalysts will be prepared and tested. The modeling of the alcohol-synthesis reaction in a membrane reactor is proceeding actively. Under standard conditions, pressure drop in the membrane reactor has been shown to be negligible. In Task 2, base case designs had previously been completed with a Texaco gasifier. Now, similar designs have been completed using the Shell gasifier. A comparison of the payback periods or production cost of these plants shows significant differences among the base cases. However, a natural gas only design, prepared for comparison purposes, gives a lower payback period or production cost. Since the alcohol synthesis portion of the above processes is the same, the best way to make coal-derived higher alcohols more attractive economically

than natural gas-derived higher alcohols is by making coal-derived syngas less expensive than natural gas-derived syngas. The maximum economically feasible capacity for a higher alcohol plant from coal-derived syngas appears to be 32 MM bbl/yr. This is based on consideration of regional coal supply in the eastern US, coal transportation, and regional product demand. The benefits of economics of scale are illustrated for the base case designs. A value for higher alcohol blends has been determined by appropriate combination of RVP, octane number, and oxygen content, using MTBE as a reference. This analysis suggests that the high RVP of methanol in combination with its higher water solubility make higher alcohols more valuable than methanol.

11446 (DOE/PC/91057–T6) **Development of an extraction process for removal of heteroatoms from coal liquids: Technical progress report No. 6, 1 July, 1993–30 September, 1993.** Gala, H.B. UOP, Inc., Des Plaines, IL (United States). 25 Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91057. Order Number DE94008003. Source: OSTI; NTIS; GPO Dep.

The objective of this contract is to develop a CO_2-water extraction process for the removal of heteroatoms from coal-derived naphtha, diesel, and jet fuel. Coal liquids are characterized by their high content of heteroatoms. Conventional techniques could remove the heteroatoms from coal liquids, but at a high hydrogen consumption and at a high cost. A successful development of the CO_2-water extraction process will increase the environmental acceptability of coal liquids and reduce the H_2 requirements for the upgrading of coal liquids. This report describes activities under two tasks: Task 2.0, Feed procurement and Task 3.0, Process variable screening studies.

11447 (DOE/PC/91281–T8) **Low severity coal liquefaction promoted by cyclic olefins: Quarterly report, July–September 1993.** Curtis, C.W. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91281. Order Number DE94008005. Source: OSTI; NTIS; GPO Dep.

Low-severity coal liquefaction allows for the solubilization of coal with reduced gas make. The idea being tested in this research is whether selective bond rupture occurs during liquefaction at low temperatures that can be satisfied by hydrogen donation from highly active hydrogen donor compounds. Promotion of coal solubilization through hydrogen transfer using highly active and effective hydrogen donors is the objective of this study. The highly effective hydrogen donors being tested are cyclic olefins. Representative cyclic olefins are isotetralin (ISO), which is 1,4,5,8-tetrahydronaphthalene, and 1,4,5,8,9, 10hexahydroanthracene (HHA). These compounds have been shown to highly effective donors (Bedell and Curtis, 1991) which release their hydrogen at fairly low temperatures, in the 200 to 300°C range. ISO has been shown to be much more effective than its hydroaromatic analogue tetralin (TET) in releasing hydrogen at low temperatures and transferring that hydrogen to an acceptor molecule or to coal (Bedell and Curtis, 1991). Likewise, at 380°C, the ability of HHA to release hydrogen in both N_2 and H_2 atmospheres was greater than a comparative hydroaromatic compound, dihydroanthracene (DHA). However, when an acceptor molecule or coal was present, DHA was as or more active than HHA in transferring hydrogen (Bedell et al., 1993). In another study, at equivalent reaction conditions and in the presence of anthracene (ANT) as a hydrogen acceptor, ISO released more than 200 times as much hydrogen as TET and HHA released 18 to 25 times as much hydrogen as DHA (Wang, 1992).

11448 (DOE/PC/91311–T9) **Configurational diffusion of asphaltenes in fresh and aged catalyst extrudates: Quarterly progress report, September 20, 1993–December 20, 1993.** Guin, J.A.; Tarrer, A.R. Auburn Univ., AL (United States). Dept. of Chemical Engineering. [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91311. Order Number DE94008378. Source: OSTI; NTIS; GPO Dep.

Objective is to determine the relation between the size and shape of coal and petroleum macromolecules and their diffusion rates in catalyst pore structures. During this past quarter, experiments using narrow molecular weight polystyrenes and alumina extrudates made in the lab were carried out (cyclohexane was used as solvent). Freundlich and Langmuir constants for the adsorption equilibrium isotherms were determined for these materials. A Langmuir isotherm was a slightly better fit for the data. Results follow the expected trend and may be used to predict the adsorption isotherm for any polystyrene and alumina combination. 8 figs, 19 refs, 4 tabs.

11449 (DOE/PC/91334–T145) **Na/Ca catalyzation of Illinois coals for gasification: Final technical report, September 1, 1992–August 31, 1993.** Jha, M.C. (AMAX Research and Development Center, Golden, CO (United States)); McCormick, R.L. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91334. Order Number DE94006809. Source: OSTI; NTIS; GPO Dep.

Gasification for power generation via IGCC processes is expected to become an important market for high sulfur Illinois Basin coals. Fluid-bed gasifiers have significant advantages over entrained flow processes. These advantages include ease of control, large turndown capacity, high thermal efficiency, and moderate oxygen and steam requirements. Three of the most pressing technical problems in fluid-bed gasification of Illinois coals are the caking tendency, high sulfur content, and low carbon conversion and consequent large char recycle required in most systems. This program explores the use of gasification catalysts to attack these three problems. The catalysts are sodium/calcium mixtures. Another advantage of using catalysts is that gasification temperature might be lowered, leading to less expensive materials of construction and a reduction in alkali vaporization. The results of this study indicate that these catalysts can reduce or eliminate the caking of Illinois coals. Loadings below 1 weight % were effective if the catalyst was added by impregnation at low pH (below about 5). An Na/Ca molar ratio of greater than 1 also leads to lower catalyst requirement.

11450 (DOE/PC/92120–T1) **[Enhancement of coal liquefaction efficiency with ceramic membrane reactors]: First quarterly report, May–July 1993.** Media and Process Technology, Inc., Pittsburgh, PA (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92120. Order Number DE94008088. Source: OSTI; NTIS; GPO Dep.

Methodology for analysis of coronene in toluene and tetraline was developed. The GC calibration of coronene in tetraline gave good reproducibility. The calibration curve covered from 0.02 to 0.12 wt %. The error was less than ±0.002 wt %. The GC analysis of coronene in toluene showed wide scattered of area counts even in the same sample bottle possibly due to the insufficient solubility of coronene in toluene. The coronene/tetraline was chosen to test on the modified membranes. Preferential permeation of the model compounds was obtained through the modified membrane. A series of one and ten inch long membranes were modified through the CVD method to reduce pore size. These tubes were characterized by He and N_2 permeation and He/SF_6 separation. The He and N_2 permeances were gradually reduced by pore size reduction. For one inch tubes, the separation factors of He/N_2 and He/SF_6 were up to 36.6 and 9.63, which were much higher than those of Knudsen (He/N_2=2.6 and He/SF_6=6.0). For the 10-inch tube, the separation factor of He/SF_6 was much lower than that of Knudsen, indicating the pore diameter was larger than 5.5Å, which was identified by the kinetic diameter of SF_6. For the purpose of coronene/tetraline separation, the pore diameter was estimated at the range of 10 to 20Å. The coronene/tetraline separation was performed in four 10-inch long membranes. The coronene rejection rate was up to 53% with the tetraline permeance about 0.15 l/m^2/hr/atm, which was nearly 50 times less than that of fresh membrane. From the results of gas and liquid separations, the pore diameter of this tube was estimated to be 15 to 20Å, and was able to deliver a rejection ratio of up to 53% on the coronene/tetraline solution. The compound 11 was provided by PETC and will be tested in the next quarter. The separation of model compound at high temperature will also be carried out in the next quarter.

11451 (DOE/PC/92521–T78) **Protocols for the selective cleavage of carbon-sulfur bonds in coal: Interim final technical report, September 1, 1992–August 31, 1993.** Bausch, M. (Southern Illinois Univ., Carbondale, IL (United States)). Illinois

Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008020. Source: OSTI; NTIS; GPO Dep.

This report presents results of research pertaining to chemical reactions that aim to selectively cleave C-S bonds in model compounds as well as Illinois coal. Chemical reactions that result in carbon-sulfur bond cleavage are an essential aspect of any protocol designed to remove organic sulfur from coal. In the second year of the project "Protocols for the Selective Cleavage of Carbon-Sulfur Bonds in Coal, the author has completed investigations of reactions in which organic sulfur-containing coal model compounds are subjected to different conditions of temperature, solvent mixtures, reagents, and radiation. He has also undertaken a series of reactions in which physically cleaned Illinois coal has been subjected to many of the same reaction conditions that were shown, via the use of model sulfides, to result in substantial C-S bond cleavage and or sulfur oxidation. Therefore, summarized in this interim final report are results of the investigations of the photooxidation reactions of coal model sulfones and sulfides; the photolytic desulfurization of coal; and various other topics, including a summary of the endeavors aimed at initiating C-S bond cleavage reactions using oxidation/chlorination/desulfurization protocols, and various tellurium reagents. Important experiments remain to be completed on this project; therefore, efforts in these areas will continue through the end of calendar year 1993.

11452 (DOE/PC/92521–T81) **Clean, premium-quality chars: Demineralized and carbon enriched: Final technical report, 1 September, 1992–31 August, 1993.** Smith, G.V. (Southern Illinois Univ., Carbondale, IL (United States)); Malhotra, V.M.; Wiltowski, T. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008023. Source: OSTI; NTIS; GPO Dep.

The overall objective of this two-year project was to evaluate methods of preparing demineralized and carbon enriched chars from Illinois Basin coals. The two processing steps, physical cleaning and devolatilization under different environments, led to the following results. Cleaning coal incompletely removes mineral matter which decreases catalytic activity and increases micropore structure. Water forms hydrogen bonds to oxygen functional groups in coal, and during drying, coals undergo structural changes which affect mild gasification. When methane reacts wit coal, devolatilization and carbon deposition occur, the rates of which depend on temperature and amount of ash. Thermal decomposition of IBC-101 coal starts at 300 C, which is much lower than previously believed, but maximum yields of liquids occur at 500 C for IBC-101 coal and at 550 C for IBC-102 coal. Aliphatic-to-aromatic ratios increase with increasing pyrolysis temperatures to 300 C and then decrease; therefore, liquids formed during gasification of 550 C or higher contain mainly aromatic compounds. Btu values of chars are higher after methane treatment than after helium treatment.

11453 (DOE/PC/92521–T82) **Sulfur removal from high-sulfur Illinois coal by low-temperature perchloroethylene (PCE) extraction: Final technical report, 1 September, 1992–31 August, 1993.** Chou, M.I.M. (Illinois State Geological Survey, Champaign, IL (United States)); Lytle, J.M.; Ruch, R.R.; Kruse, C.W.; Chaven, C.; Hackley, K.C.; Hughes, R.E.; Harvey, R.D.; Frost, J.K.; Buchanan, D.H.; Stucki, J.W.; Huffman, G.P.; Huggins, F.E. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008024. Source: OSTI; NTIS; GPO Dep.

The Midwest Ore Processing Co. (MWOPC) has reported a precombustion coal desulfurization process using perchloroethylene (PCE) at 120 C to remove up to 70% of the organic sulfur. The purposes of this research were to independently confirm and possibly to improve the organic sulfur removal from Illinois coals with the PCE desulfurization and to verify the ASTM forms-of-sulfur determination for evaluation of the process. An additional goal was to develop a dechlorination procedure to remove excess PCE from the PCE-treated coal. A laboratory scale operation of the MWOPC PCE desulfurization process was demonstrated, and a dechlorination procedure to remove excess PCE from the PCE-treated coal was developed. The authors have determined that PCE desulfurization removed mainly elemental sulfur from coal. The higher the level of coal oxidization, the larger the amount of elemental sulfur that is removed by PCE extraction. The increased elemental sulfur during short-term preoxidation is found to be pH dependent and is attributed to coal pyrite oxidation under acidic (pH < 2) conditions. The non-ASTM sulfur analyses confirmed the hypothesis that the elemental sulfur produced by oxidation of pyrite complicates the interpretation of analytical data for PCE process evaluations when only the ASTM forms-of-sulfur is used. When the ASTM method is used alone, the elemental sulfur removed during PCE desulfurization is counted as organic sulfur. A study using model compounds suggests that mild preoxidation treatment of coal described by MWOPC for removal of organic sulfur does not produce enough oxidized organic sulfur to account for the amounts of sulfur removal reported. Furthermore, when oxidation of coal-like organosulfur compounds does occur, the products are inconsistent with production of elemental sulfur, the product reported by MWOPC. Overall, it is demonstrated that the PCE process is not suitable for organic sulfur removal.

11454 (DOE/PC/92521–T83) **Microbial strain improvement for organosulfur removal from coal: Final technical report, 1 September, 1992–31 August, 1993.** Kilbane, J.J. II (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008025. Source: OSTI; NTIS; GPO Dep.

IGT has developed a microbial culture of Rhodococcus rhodochrous, designated as IGTS8, that is capable of specifically cleaving carbon-sulfur bonds in a range of organosulfur model compounds and is capable of removing organic sulfur from coal and petroleum without significantly sacrificing the calorific value of the fuel. Although IGTS8 possesses the ability to specifically remove organic sulfur from coal, a major research need is to develop improved strains of microorganisms that possess higher levels of desulfurization activity and therefore will permit more favorable biodesulfurization process conditions: faster rates, more complete removal, and smaller reactor size. Strain improvement is the single most important aspect to the development of a practical coal biodesulfurization process and accordingly is the focus of research in this project. During the past year, significant progress was made toward improving the biodesulfurization capabilities of Rhodococcus Rhodochrous IGTS8. The main objective was to identify and characterize strong promoters of IGTS8. The DNA sequencing of the promoter region and chloramphenicol resistance gene of pRF2, as well as six mutant promoters, was determined. The 16S structural gene of IGTS8 was isolated and used to identify the putative promoter of this gene. Four promoter probe vectors were constructed and are currently being used to analyze the strength of Rhodococcus promoters: from the IGTS8 genome, mutants of promoters from the chloramphenicol resistance gene of pRF2, the promoter from the 16S RNA gene, and various strong inducible promoters.

11455 (DOE/PC/92521–T84) **Mild temperature gasification: Partitioning sulfur to gas as H_2S: Interim final technical report, 1 September, 1992–31 August, 1993.** Stencel, J.M. (Univ. of Kentucky, Lexington, KY (United States)); Neathery, J.K.; Schaefer, J.L.; Yang, Jidong. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008026. Source: OSTI; NTIS; GPO Dep.

Bench-scale, mild-temperature fluidized bed gasification (MTFBG) was performed on three high sulfur Illinois basin coals after mixing with phosphoric acid. The research initiated development of an advanced processing technology which partitions coal sulfur to the gas phase as H_2S. The MTFBG experiments were performed on Illinois coals IBC-101, IBC-106 and IBC-110. Product yields were between 60–85% char, 0.4–1.3% tar and 15–43% gases. Gas yields were sensitive to the coal/acid mixing ratios and the residence time of the coal within the gasifier. Tar and gas yields were significantly lower for coal/acid feeds than for coal-only

feeds. At 500 C, the sulfur removal was as high as 82% for IBC-106; sulfur emissions during combustion of this char would be 1.10 lbs SO_2/MMBtu. Emissions levels from the IBC-110 char would be 1.15 lbs SO_2/MMBtu whereas it would be 2.15 lb SO_2/MMBtu from the IBC-101 char. In comparison, the emission levels from chars produced during gasification of coal using no acid would be 4.35 (IBC-110) and 4.81 (IBC-101), whereas the emission levels of the parent coals would be between 5–6 lb SO_2/MMBtu. Gas product analysis confirmed that the coal sulfur was removed as H_2S. Pressurized hot-water filtration of the chars removed nearly 80% of the phosphorus. Its removal rate should be near 95% to restrain the reagent cost to less than $25/Ton of SO_2.

11456 (DOE/PC/92521–T86) **Upgrading mild gasification liquids to produce electrode binder pitch: Final technical report, 1 September, 1992–31 August, 1993.** Knight, R.A. (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 34p. Sponsored by USDOE, Washington, DC (United States);Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). DOE Contract FC22-92PC92521. Order Number DE94008028. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to investigate the production of electrode binder pitch, from mild gasification liquids. The IGT MILDGAS process pyrolyzes coal in a fluidized/entrained bed to produce solid, gas, and liquid co-products. The largest market for pitch made from coal liquids is the aluminum industry, which uses it to make carbon anodes for electrolytic furnaces. In this project, crude pitch from the DOE-sponsored MILDGAS process research programs being modified by a flash thermocracking technique to achieve specifications typical of a binder pitch. Atomization of the pitch at the thermocracker inlet is being examined as a method of optimizing the particle size of polymerized pitch components. Six successful thermocracking tests were performed with a crude Illinois No. 6 pitch from 1,110 F MILDGAS PRU runs. The tests were conducted at 1,200–1,500 F with pitch feed rates of 2.6–12.7 g/min and residence times of 2.6–4.5 seconds. Tests were conducted with and without an atomizing nozzle to evaluate the effects of atomization on the primary quinoline- and toluene-insoluble (QI and TI) content of the pitch. Key pitch properties improved in all cases, with higher temperatures resulting in increased softening point (187–273 F), QI (10–16%), TI (18–41%), coking value (38–55%), C:H ratio (1.17–1.57), and density (1.16–1.26). Higher reactor loading appears to promote more coke and gas production, but atomization promotes higher yield of cracked pitch, oil, and gas and less coke. The products of pitch cracking ranged from 26–54 wt% cracked pitch, 13–44 wt% coke, 16–28 wt% oils, and 3–23 wt% high-Btu gas. The pitch cokes had C:H atomic ratios of 1.95–2.93, which could be increased by calcination for use as a carbon anode filler.

11457 (DOE/PC/92521–T89) **Physical cleaning of waste coal by dissolved-CO_2 flotation: Final technical report, September 1, 1992–August 31, 1993.** Shiao, S.Y. (Babcock and Wilcox Co., Alliance, OH (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008031. Source: OSTI; NTIS; GPO Dep.

The coal wastes generated from coal mining operations and coal cleaning processes contain fine and ultrafine coals. Recovery of the fine/ultrafine coal from the coal wastes reduces the loss of useable fuels and the environmental impact. The objective of this project was to use dissolved-CO_2 technology to generate ultrafine bubbles to separate fine/ultrafine coal from pyrite and other mineral matter in the coal wastes. The Illinois No. 6 coal waste used in the project was the underflow from a refuse thickener. The concentrations of the major trace metals are much higher than those found in Illinois Basin Coal database for Illinois No. 6 coals. Bench-scale conventional flotation tests of the waste coal were performed under various conditions using a 4-liter Wemco flotation cell. The tests were performed to determine the chemical dosages and flotation conditions used in dissolved-CO_2 column flotation. The waste coal samples were subjected to dissolved-CO_2 flotation in a 2-inch diameter microbubble column under various test conditions. The flotation performance as affected by each test variable was compared. For most of the tests, the Btu recovery was above 80%, the pyrite rejection was about 60%, and the ash rejection varied from about 45% to 76%. Dissolved air was used in one test for comparison. The waste coal samples were also subjected to typical microbubble flotation. As compared to microbubble flotation, the dissolved-CO_2 had higher yield, higher Btu recovery, less pyrite rejection, and less ash rejection. Almost all of the major trace metals had a substantial reduction in concentration by dissolved-CO_2 flotation, particularly for cadmium, chromium, nickel, and lead.

11458 (DOE/PC/92521–T90) **Biodesulfurization of mild gasification liquid products: Final technical report, 1 September, 1992–31 August, 1993.** Kilbane, J.J. II (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008032. Source: OSTI; NTIS; GPO Dep.

The mild gasification of coal, as being developed at IGT and elsewhere, is a promising new technology that can convert coal to multiple products: gas, solid, and liquids. Mild gasification liquids can be used as feedstock to make transportation fuels and chemicals. However, the sulfur content and aromaticity of mild gasification liquids limits their usefulness and biodesulfurization can potentially decrease both sulfur content and aromaticity. The objective of this project is to investigate and feasibility of using biodesulfurization to upgrade the quality of mild gasification liquids. During this project, it was shown that the middle distillate (360–440 F) fraction of liquids derived from the mild gasification of coal, and unfractionated liquids can be biodesulfurized. Moreover, it was demonstrated that lysed cell preparations and freeze-dried cells can be used to biodesulfurize mild coal gasification liquids. The importance of the finding that freeze-dried biocatalysts can be used to biodesulfurize mild coal gasification liquids is that freeze-dried cells can be produced at one location, stored indefinitely, and then shipped (at reduced weight, volume, and cost) to another location for coal biodesulfurization. Moreover, freeze-dried biocatalysts can be added directly to mild coal gasification liquids with only minimal additions of water so that reactor volumes can be minimized.

11459 (DOE/PC/92521–T93) **Development of novel copper-based sorbents for hot-gas cleanup: Final technical report, 1 September 1992–31 August, 1993.** Hill, A.H. (Institute of Gas Technology, Chicago, IL (United States)); Abbasian, J.; Flytzani-Stephanopoulos, M. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008035. Source: OSTI; NTIS; GPO Dep.

The objective of this investigation is to evaluate two novel copper-based sorbents, namely Cu-Cr and Cu-Ce, for their effectiveness in removing hydrogen sulfide from fuel gas in the temperature range of 650 to 850 C. Such high temperatures will be required for the new generation of gas turbines in Integrated Gasification Combined Cycle systems. Structural and kinetic studies were conducted on various compositions of the two Cu-based sorbents to determine the optimum sorbent composition. The effect to operating conditions on the performance of the sorbents along with the stability and regenerability of the selected sorbents in successive sulfidation/regeneration operation were determined. Overall, the CuO-lean binaries (with Cr_2O_3 or CeO_2) may benefit the H_2S breakthrough levels. While this is at the expense of sulfur capacity for the Cu-Cr-O sorbents, it may not affect the capacity of the Cu-Ce-O sorbents. Parametric multicycle desulfurization tests were conducted in a bench-scale quartz reactor at one atmosphere using the $CuCr_2O_4$ and CuO-CeO_2 sorbents. The parameters studied included temperature, space velocity, and feed gas composition. Both sorbents were able to reduce the H_2S concentration of the reactor feed gas from 5,000 ppmv to less than 1 ppmv to 10 ppmv at 750 to 850 C. Both sorbents were found to consume H_2 and produce SO_2 during the initial stages of sulfidation. Analysis of partially sulfided samples identified predominantly Cu metal, the additive oxide and small amounts of oxidic copper. For the Cu-Cr-O sorbents, the latter is apparently sufficient to keep the H_2S pre-breakthrough levels as low as has been reported in this work.

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For the Cu-Ce-O sorbents, in which very little or no oxidic copper remained, the low H_2S levels may be due to the participation of CeO_2, whose sulfidation is promoted by Cu.

11460 (DOE/PC/92521–T118) **Reactivity of target compounds for chemical coal desulfurization: Quarterly technical report, September 1, 1993–November 30, 1993.** Buchanan, D.H. (Eastern Illinois Univ., Charleston, IL (United States)); Amin, M.; Cunningham, R.; Galyen, J.; Tong, Y. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008412. Source: OSTI; NTIS; GPO Dep.

This project seeks to determine the identity of representative organosulfur compounds removed by coal desulfurization reactions. Demineralized coals from the Illinois Basin Coal Sample Program are solvent extracted and the extracts fractionated to separate and concentrate the organosulfur compounds for analysis by Gas Chromatography/Mass Spectroscopy. After the sulfur compounds are characterized, the parent extracts will be subjected to reactions previously shown to reduce the organic sulfur content of Illinois coals. The treated extracts will be fractionated and analyzed for organosulfur content by the same method to determine which compounds reacted during the chemical treatment. Finally, the original coal will be subjected to chemical desulfurization, extraction, fractionation and analysis in order to correlate changes in organic sulfur content of the coal with reactions of specific sulfur compounds. These compounds can thus be reliably considered as target molecules for the next generation of desulfurization processes. Work during this quarter included studies to increase the amount of soluble material extracted from coal by several solvents and development of standard chromatographic methods for fractionation and analysis of soluble coal fractions. Pyridine solubility of several coals is enhanced by removal of mineral matter prior to extraction. The effect is modest (12% relative increase) for Illinois No. 6 coal and greater for lower rank coal. Ultrasound and swelling agents cause a large increase in pyridine solubility. Although toluene extracts much less material from Illinois coals than pyridine, removal of mineral matter prior to extraction causes a relatively larger increase in extraction yield (60 - 80% relative increase). Expected aromatic sulfur compounds such as dibenzothiophene have been detected by GC/MS analysis of non-polar fractions of Illinois No. 6 extracts and several oxidized thiophenes were detected in extracts of weathered IBC-105 coal.

11461 (DOE/PC/92521–T119) **Molecular biological enhancement of coal biodesulfurization: Quarterly technical report, September 1, 1993–November 30, 1993.** Kilbane, J.J. II (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008413. Source: OSTI; NTIS; GPO Dep.

IGT has developed a microbial culture of Rhodococcus rhodochrous, designated as IGTS8, that is capable of specifically cleaving carbon-sulfur bonds in a range of organosulfur model compounds and is capable of removing organic sulfur from coal and petroleum without significantly sacrificing the calorific value of the fuel. Although IGTS8 possesses the ability to specifically remove organic sulfur from coal, a major research need is to develop improved strains of microorganisms that possess higher levels of desulfurization activity and therefore will permit more favorable biodesulfurization process conditions: faster rates, more complete removal, and smaller reactor size. strain improvement is the single most important aspect to the development of a practical coal biodesulfurization process and accordingly is the focus of research in this project. During this quarter the promoter probe vectors that were constructed last quarter were found to be unstable in E. coli. Fragments of R. rhodochrous IGTS8 chromosomal DNA were cloned into pRCAT3 and pRCM1 (previously described in final ICCI report 1993). Many derivatives of pRCM1 and pRCAT3 receiving inserts that regulated the expression of chloramphenicol resistance in Rhodococcus rhodochrous IGTS8 proved to be unstable in E. coli frequently yielding plasmids containing deletions. Stable inserts have been observed ranging from 100 bp to 2.0 kb that regulated expression in Rhodococcus rhodochrous IGTS8. Subtractive hybridization studies continue, several candidates have been isolated and are being confirmed for inducible promoters. Primer extension analysis of the Rhodococcus rhodochrous IGTS8 16S RNA promoter region was initiated this quarter.

11462 (DOE/PC/92521–T120) **Analyzing organic sulfur in coal/char: Integrated mild degradation/XANES methods: [Quarterly] technical report, September 1–November 30, 1993.** Palmer, S.R. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes); Huffman, G.P. Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes. [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008414. Source: OSTI; NTIS; GPO Dep.

To address the acid rain problem effort has been expended on finding methods for the removal of sulfur from coal. Despite these efforts organic sulfur has proven very difficult to remove. Perhaps the single most important reason for this is the fact that the organic sulfur in coal remains very poorly characterized. Thus, objective of this study is to combine advanced nondestructive and advanced destructive methods of sulfur analysis for characterization of the organic sulfur in Illinois Basin coals and mild gasification chars derived from them. Thus, the study combines selective oxidation strategies, analytical pyrolysis, and sulfur X-ray Absorption Near Edge Structure Spectroscopy (XANES) analysis. In, addition identical samples are to be provided for W-Band EPR spectroscopy. During the previous quarter ten coal derived samples have been prepared with the sulfur content varing from 0.77 to 4.4%. Each sample has been submitted for XANES analysis, W-Band EPR analysis, and analytical pyrolysis. A mild gasification reactor has been designed and is undergoing final assembly.

11463 (LBL–35049) **Fundamental studies of the mechanism of catalytic reactions with catalysts effective in the gasification of carbon solids and the oxidative coupling of methane: Quarterly report, October 1–December 31, 1993.** Heinemann, H.; Iglesia, E.; Perry, D.L. Lawrence Berkeley Lab., CA (United States). Dec 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007494. Source: OSTI; NTIS; GPO Dep.

This report covers the time period from October 1 through December 31, 1993. A description of tasks for fiscal year 1994 is included in this report. Highlights and progress of work performed during this quarter is reported in (a) catalytic steam gasification of coals and cokes; (b) oxidative coupling of methane; and (c) synthesis and characterization of catalysts. Attached to this report is a copy of a manuscript submitted to Proceeding of Fuels Technology Contractors Meeting "Steady-State and Transient Catalytic Oxidation and Coupling of Methane" by Heinemann, Iglesia, and Perry.

11464 A gas stream clean-up filter and method for forming same. Mei, J.S.; Halow, J.S.; DeVault, J.D. To Dept. of Energy. 1992. U.S. patent application 7-850,478. 29p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007333. Source: OSTI; NTIS; GPO Dep.

A gas cleaning filter is formed in-situ within a vessel containing a fluidizable bed of granular material of a relatively large size fraction. A filter membrane provided by a porous metal or ceramic body or such a body supported a perforated screen on one side thereof is coated in-situ with a layer of the granular material from the fluidized bed by serially passing a bed-fluidizing gas stream through the bed of granular material and the membrane. The layer of granular material provides the filtering medium for the combined membrane-granular layer filter. The filter is not blinded by the granular material and provides for the removal of virtually all of the particulates from a process gas stream. The granular material can be at least partially provided by a material capable of chemically reacting with and removing sulfur compounds from the process gas stream. Low level radioactive waste containing organic material may be incinerated in a fluidized bed in communication with the described filter for removing particulates from the gaseous combustion products.

11465 (VTT-PUB–149) **Studies of peat properties for fluidized-bed gasification.** Moilanen, A. (Technical Research

Centre of Finland, Espoo (Finland). Lab. of Fuel and Process Technology). Technical Research Centre of Finland, Espoo (Finland). 1993. 70p. Order Number DE94722001. Source: OSTI; NTIS.

The impetus for this study was given by problems due to the formation of ash deposits in the High Temperature Winkler gasifier (HTW), when peat was used as a raw material. In this licentiate thesis, properties of peat used in the fluidized-bed gasification process were studied in order to understand the problematic behavior of peat ash in the process, and factors affecting it. The subjects of the study were, how ash is formed and how it behaves in gasification conditions. In microscopic studies it was found that the deposits were formed from spherical ash particles, which were sticked together by a neck forming a porous structure. Therefore, the deposit formation was considered to be a result of fly ash sintering, which followed the mechanism known as the sintering by viscous flow. Consequently, sintering of different peat ashes, effect of ash chemical composition and ash viscosity were studied experimentally in laboratory. The sintering of ash was studied with a method developed for fly-ash sintering. The method is based on strength measurement of sample pellets, which are heat-treated at temperatures between 700 and 900 deg C. This method relates to the strength of a deposit formed in a process. With the method it was tested, how the adding of iron, sodium and phosphorus to a known peat ash affected sintering and how the sintering tendency of several peat ashes varied. In addition, viscosities of different peat ash slags as a function of temperature were measured with a needle-penetration viscosimeter.

0105 Products and By-Products

Refer also to citation(s) 11456, 12435

11466 (DOE/PC/92521–T71) **Coal combustion under conditions of blast furnace injection: Final technical report, September 1, 1992–August 31, 1993.** Crelling, J.C. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Geology); Case, E.R. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008013. Source: OSTI; NTIS; GPO Dep.

A potentially new use for Illinois coal is as a fuel injected into a blast furnace to produce molten iron as the first step in steel production. Because of its increasing cost and decreasing availability, metallurgical coke is now being replaced by coal injected at the tuyere area of the furnace where the blast air enters. The purpose of this study is to evaluate the combustion of coal during the blast furnace injection process and to delineate the optimum properties of the feed coal. This investigation is significant to the use of Illinois coal in that the limited research to date suggests that coals of low fluidity and moderate to high sulfur and chlorine contents are suitable feedstocks for blast furnace injection. During the first phase of this project a number of the objectives were realized, specifically: (1) a blast furnace sampling system was developed and used successfully to collect samples inside an active furnace; (2) two sets of blast furnace samples were collected and petrographic analysis showed that char derived from injected coal is entering the reduction zone of the furnace; (3) a coal/char sampling probe was designed and fabricated; (4) the completion of a program of reactivity experiments on the injected coal char, blast furnace coke and Herrin No. 6 char. The results of the reactivity experiments indicate that Herrin No. 6 coal is similar or even superior to coals now being used in blast furnace injection and that additional testing is warranted.

11467 (DOE/PC/92521–T76) **Utilization of Illinois coal gasification slags for production of ultra-lightweight aggregates: Final technical report, September 1, 1992–August 31, 1993.** Choudhry, V. (Praxis Engineers, Inc., Milpitas, CA (United States)); Zimmerle, T. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008018. Source: OSTI; NTIS; GPO Dep.

This research was aimed at testing and developing the expansion potential of solid residues (slag) from gasification of Illinois coals to manufacture ultra-lightweight aggregates (ULWA). Conventional ULWAs are manufactured by pyroprocessing perlite or vermiculite ores and have unit weights in the 5–12 lb/ft^3 range. These materials sell for approximately $200/ton ($1.00/ft^3) and have numerous applications. The incentive for this effort was based on previous experimental results in which lightweight aggregates (LWA) with unit weights of 25–55 lb/ft^3 were produced from Illinois slag using a direct-fired furnace. In this program, bench-scale expansion tests conducted with two Illinois coal slags resulted in product unit weights of 12 and 18.5 lb/ft^3, thus confirming the feasibility of producing ULWA from Illinois slags. During initial pilot vertical shaft furnace test runs, two Illinois slags were expanded to generate products with unit weights of 12.5–26.5 and 20–52 lb/ft^3. Further attempts to lower the product unit weights resulted in fusion of the slag. This problem could be overcome by methods including surface treatment of the slag, blending the slag with other materials, or utilization of indirect firing methods. To lower the product unit weights, an indirect-fired horizontal shaft furnace was used and products with unit weights of 12.4–52.0 lb/ft^3 were generated, thus indicating that this method can be used to produce a wide range of expanded products. A large batch of expanded slag was produced using an 18-in. diameter x 12-ft long indirect-fired pilot furnace. A sample from this batch was characterized. Specimens of insulating concrete made from expanded slag had a unit weight 43.3 lb/ft^3 and thermal conductivity of 1.34 Btu-in./h/ft^2/°F. This compares well with a value of 1. 2 Btu-in./h/ft^2/°F for insulating concrete of a similar weight made from perlite, as per ASTM C 332-82.

11468 (DOE/PC/92521–T85) **Production of carbon molecular sieves from Illinois coal: Final technical report, 1 September, 1992–31 August 1993.** Lizzio, A.A. (Illinois State Geological Survey, Champaign, IL (United States)); Rostam-Abadi, M. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008027. Source: OSTI; NTIS; GPO Dep.

Carbon molecular sieves (CMS) have become an increasingly important class of adsorbents for use in gas separation and recovery processes. The overall objective of this project is to determine whether Illinois Basin coals are a suitable feedstock for the production of CMS and to evaluate the potential application of these products in commercial gas separation processes. In Phase 1 of this project, gram quantities of char were prepared from Illinois coal in a fixed-bed reactor under a wide range of pyrolysis and activation conditions. Chars having surface areas of 1,500–2,100 m^2/g were produced by chemical activation using potassium hydroxide (KOH) as the chemical activant. These high surface area (HSA) chars had more than twice the adsorption capacity of commercial molecular sieves. The kinetics of adsorption of various gases, e.g., O_2, N_2, CO_2, CH_4, and H_2, on these chars at 25 C was determined. Several chars showed good potential for efficient O_2/N_2, CO_2/CH_4 and CH_4/H_2 separation. In Phase 2 of this project, larger quantities of char are being prepared from Illinois coal in a batch fluidized-bed reactor and in a continuous rotary tube kiln. The ability of these chars to separate binary gas mixtures is tested in an adsorption column/gas chromatography system. Oxygen and nitrogen breakthrough curves obtained for selected chars were compared to those of a commercial zeolite. Selected chars were subjected to a nitric acid oxidation treatment. The air separation capability of nitric acid treated char was strongly dependent on the outgassing conditions used prior to an O_2/N_2 adsorption experiment. An outgassing temperature of 130–160 C produced chars with the most favorable air separation properties. 61 refs.

11469 (DOE/PC/92521–T87) **Integrated production/use of ultra low-ash coal, premium liquids and clean char: Interim final technical report, 1 September, 1992–31 August, 1993.** Kruse, C.W. (Illinois State Geological Survey, Champaign, IL (United States)); Carlson, S.L.; Fatemi, M.; Snoeyink, V.L.; Feizoulof, C.A.; Klavetter, E. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008029. Source: OSTI; NTIS; GPO Dep.

The ultimate objective of this project is to attain high-value, coal-derived products, especially varieties of char, from Illinois coal. The chars (carbons) made in this study, because of their special properties, could become the marketable materials having the highest value in the product set. Tests this quarter followed up on an unexpected correlation of surface properties of a variety of oxidized carbons with adsorption phenomena. Additional oxidized carbons were made at the ISGS and tests to establish the reproducibility of results were begun. Work will be continued through December on a no-cost extension.

11470 (DOE/PC/92521–T88) **Investigation of a sulfur reduction technique for mild gasification char: Final technical report, September 1, 1992–August 31, 1993.** Knight, R.A. (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008030. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to investigate the desulfurization of mild gasification char using H_2:CH_4 mixtures. Mild gasification of coal produces char, liquids, and gases at 1000°–1500°F and near-ambient pressure. Char, comprising 60–70% of the product, can be used to make high-value form coke for steel making and foundries. A sulfur content below 1 wt% is desirable, and char from high-sulfur Illinois coals must be upgraded to meet this criterion. In the first year of the program, Illinois No. 6 chars were treated in a batch fluidized bed with H_2:CH_4 blends containing 9–24 vol% CH_4 at 1100°–1600°F and 50–200 psig. Sulfur removals up to 92.5 wt% were obtained, and the char desulfurization susceptibility was related to porosity, density, and carbon crystallite size. During the second year, the relationships among mild gasification parameters, char properties, char desulfurization susceptibility, and form coke properties were studied. Acid washing of coal to remove Ca and Fe was explored for its effect on subsequent sulfur removal, and secondary desulfurization of form coke produced from the desulfurized chars was studied. Desulfurization tests of entrained and fluidized-bed reactor chars from IBC-105 coal were completed. Acid-washing of the coal prior to mild gasification or the char prior to desulfurization increased its susceptibility to desulfurization, with sulfur content reduced to as low as 0.10 wt % dry char. Fluidized-bed chars were easier to desulfurize than entrained chars, with or without acid-washing. Form coke briquettes were prepared from selected chars and mild gasification pitch binder, and then carbonized under both N_2 and H_2:CH_4 atmospheres. carbonization in H_2:CH_4 removed additional sulfur from the form coke. Adequate tensile strength (837 psi) was achieved in briquettes with 1.2 wt% sulfur made from desulfurized char.

11471 (DOE/PC/92521–T96) **Evaluation and utilization of Illinois FBC residues for construction materials: Final technical report, September 1, 1992–August 31, 1993.** Ghafoori, N. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Civil Engineering and Mechanics); Sami, S. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008038. Source: OSTI; NTIS; GPO Dep.

The overall objective of this program is to investigate the extent to which fluidized bed combustion (FBC) by-products can be properly utilized as viable construction materials. This investigation focuses primarily on the properties of residues derived from fluidized combustion burning of Illinois high-sulfur coal. The research plan calls for evaluation of physico-chemical and engineering characteristics of the FBC-based cement and non-cement mixes. The results of this study will be used to compare the physical and mechanical properties of the FBC-based mixtures with those of conventional mixes. The suitability of using FBC residues as filler or binder aggregates for Portland cement-based mixtures and non-Portland cement mixes in the form of conventional and roller compacted materials will be evaluated. During this reporting period, laboratory specimens relevant to the final phase of this research program, engineering characteristics of the optimized FBC spent bed and fly ash concretes (Task 1), and engineering properties of the optimized roller compacted non-cement FBC mixes (Task II) were fabricated. Tests to ascertain fresh characteristics, strength and elastic properties, and long-term durability were completed.

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Refer also to citation(s) 11419, 11451, 11452, 11460, 11462, 11465, 11505, 12633

11472 (ANL/CHM/CP–81164) **Scanning transmission x-ray microscopy: A new "looking glass" into coal chemical structure.** Botto, R.E.; Cody, G.D. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–13: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006838. Source: OSTI; NTIS; GPO Dep.

This paper reports the use of scanning transmission x-ray microscopy to spatially map the chemistry of aromatic and aliphatic carbon functionalities in coal to a resolution of less than 0.1 μm. Localized x-ray absorption spectroscopy recorded at the carbon K absorption edge was also used to facilitate analysis of variations in fundamental chemistry at maceral interfaces and within maceral boundaries.

11473 (ANL/CHM/CP–81165) **NMR imaging of heterogeneous coal macromolecular networks.** Cody, G.D.; French, D.C.; Botto, R.E. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–8: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006836. Source: OSTI; NTIS; GPO Dep.

This paper reviews earlier NMR studies and provides an overview of present and future applications of NMR imaging for coal structure determination.

11474 (ANL/CHM/CP–81225) **Adventures in maceral separation.** Dyrkacz, G.R. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–15: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006817. Source: OSTI; NTIS; GPO Dep.

Progress has been made in recent years in the science of maceral separation. However, there are many areas that can be improved and new areas investigated. Power of density gradient centrifugation to physically resolve macerals and submaceral species coupled with other instrumental techniques is attractive for defining the limits of coal heterogeneity as well as investigating the ability of other separation methods.

11475 (ANL/CHM/CP–81246) **A perspective on the status of coal research from shipments of samples.** Vorres, K.S. (Argonne National Lab., IL (United States)); Kruse, C.W.; Nater, K.A.; Glick, D.C.; Davis, A. Argonne National Lab., IL (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–11: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006818. Source: OSTI; NTIS; GPO Dep.

Research on all aspects of coal research, at least for more small scale work, involves the use of samples at the beginning of experimental work. Most research workers for smaller scale work do not collect their own coal samples, but rather order them from a group of sample suppliers. The number of suppliers meeting the major needs in the US, as well as for the world, is not very large. An examination of the shipments of samples from each of these suppliers will give an interesting insight into the general trends in volume of work in the field. The suppliers involved in this study include the Argonne Premium Coal Sample Program, the Illinois Basin Coal Sample Program, the SBN and the several groups of samples from the Pennsylvania State University Coal Sample Bank. Each of these supplies a different number of samples in varying quantities. The quantities and variety of samples is important to the individual worker in selecting a supplier. The type of work to be done frequently affects the quantities and choice of

sample, which in turn affects the choice of supplier. In general these data indicate that researchers realize the advantages of acquiring samples from centralized sample banks. These advantages include a lower cost than would be incurred from individual sampling and preparation; availability of analyzed samples; preservation of samples and the possibility of comparing results with others who have worked on the same samples.

11476 (ANL/CHM/CP–81657) **Organic structure components within the Argonne premium coal samples.** Winans, R.E. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–14: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006843. Source: OSTI; NTIS; GPO Dep.

Several key features are evident from examining the data (desorption electron impact high resolution mass spectrometry) from the Argonne coals. First, the aromatic clusters are not very large. Second, heteroatoms are associated with a majority of the clusters. Finally, we need more quantitative information on the links between clusters.

11477 (ANL/CHM/PP–72140) **Extensive utilization of Argonne Premium Coals in research.** Vorres, K.S. Argonne National Lab., IL (United States). [1991]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008114. Source: OSTI; NTIS; GPO Dep.

Over 200 basic research papers have now resulted from fundamental studies of the 14,000 samples of the Argonne Premium Coals that have been shipped to coal scientists in this country and abroad. This research community has recognized the unprecedented opportunity that the premium samples afford to compare, contrast, and correlate experimental information obtained in different laboratories on coal samples that are uniform, stable, and in long-term supply. Indeed, a number of groups are using this set of materials exclusively in their basic coal research programs. The selection, collection, processing, packaging, characterization, and shipping have been done under the supervision of Dr. Karl S. Vorres at Argonne National Laboratory with the support of the Division of Chemical Sciences. The coal-processing facility is unique in the world for its ability to process ton-sized coal samples into sealed, uniform, 5- or 10-g lots in pyrex ampoules, completely under nitrogen kept below 100-parts-per-million oxygen.

11478 (CONF-940301–16) **The role of model compound studies in coal research.** Buchanan, A.C. III; Britt, P.F. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 207. spring national meeting of the American Chemical Society (ACS); San Diego, CA (United States); 13-18 Mar 1994. Order Number DE94007210. Source: OSTI; NTIS; GPO Dep.

The extraordinarily complex chemical and physical structure of coals continues to present coal scientists with major challenges in advancing the base of scientific knowledge required for the development of substantially improved coal utilization technologies. As a consequence, model compound studies play a foundational role in advancing coal science. Model compounds are employed in studies for: (a) determination of kinetic and mechanistic information relevant to coal pyrolysis and liquefaction chemistry, and to computational modeling of these processes; (b) development of new catalysts for coal conversion or upgrading of coal-derived liquids; (c) development and benchmarking of various spectroscopic methods for analysis of coal structure and constitution by NMR, FTIR, mass spectrometry, X-ray techniques (XPS, XANES), etc.; and, (d) exploration and development of new chemical reactions for coal such as deploymerization under mild conditions, selective heteroatom removal etc. The choice of a model compound should not be prescribed, and the rational for the selection can vary with the goal of the research. The breadth of use of model compounds in coal research precludes a thorough examination in this report.

11479 (DOE/PC/91047–T6) **Investigation of coal structure: Quarterly report No. 7, October 1, 1993–December 31, 1993.** Viking Systems International, Inc., Pittsburgh, PA (United States). Jan 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC91047. Order Number DE94008371. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to investigate the physical structure of coal illustrated. Coal structure should be well understood to guarantee effective utilization. A better understanding of this physical structure is the first step for effective development of coal utilization processes. Solvent swelling and extraction are the two main investigative probes in this project. No single solvent tested to date can disrupt all of the relatively strong secondary interactions in coal. Various relatively strong secondary interactions must be solvated step by step using appropriate procedures. If physical association is considerable, coal should be readily extracted. Physical association will be evaluated by coal swelling using conventional and new methods. To investigate the effects of low coal concentration and continuous mixing, a new method will be developed. The focus of the work was directed toward a specific bituminous coal low in sulfur and iron. Blind Canyon (DECS-16) coal obtained from the Penn State Coal Bank has been used in this project. Contract activities for this period are: (1) The swelling kinetics were evaluated by conventional procedures using glass tubes. Diffusion of solvent into the coal was small, and solvation of intra- and intermolecular interactions was the rate determining step for swelling. (2) A newly established technique using laser scattering has been used to evaluate interparticle aggregation and swelling. It was observed that particles from certain fractions of specific coals were selectively aggregated in particular solvents. (3) Pyridine extractability after soaking in phenol at 200–250°C was studied. Approximately 70 wt % of Blind Canyon (DECS-16) coal was extracted under the optimum condition. A significant amount of phenol, however, was physically retained. (4) The associated molecular structure of coal proposed has been supported by associative equilibria during soaking in poor and good solvents.

11480 (DOE/PC/91296–9) **Advanced NMR-based techniques for pore structure analysis of coal: Quarterly report No. 9, October 1, 1993–December 30, 1993.** Smith, D.M. New Mexico Univ., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91296. Order Number DE94008305. Source: OSTI; NTIS; GPO Dep.

One of the main problems in coal utilization is the inability to properly characterize its complex pore structure. Coals typically have micro/ultra-micro pores but they also exhibit meso and macroporosity. Conventional pore size techniques (adsorption/condensation, mercury porosimetry) are limited because of this broad pore size range, microporosity, reactive nature of coal, samples must be completely dried, and network/percolation effects. Small angle scattering is limited because it probes both open and dosed pores. Although one would not expect any single technique to provide a satisfactory description of a coal's structure, it is apparent that better techniques are necessary. Small angle scattering could be improved by combining scattering and adsorption measurements. Also, the measurement of NMR parameters of various gas phase and adsorbed phase NMR active probes can provide pore structure information. We will investigate the dependence of the common NMR parameters such as chemical shifts and relaxation times of several different nuclei and compounds on the pore structure of model microporous solids, carbons, and coals. In particular, we will study the interaction between several small molecules (^{129}Xe, ^{3}He, $^{14}N_2$, $^{14}NH_3$, $^{15}N_2$, $^{13}CH_4$, $^{13}CO_2$) and pore surface. Our current work may be divided into three areas: small-angle X-ray scattering (SAXS), adsorption, and NMR.

11481 (DOE/PC/91299–13) **Magnetic relaxation – coal swelling, extraction, pore size: Quarterly technical progress report, October 1, 1993–December 31, 1993.** Doetschman, D.C. State Univ. of New York, Binghamton, NY (United States). Dept. of Chemistry. [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91299. Order Number DE94008383. Source: OSTI; NTIS; GPO Dep.

During this quarter, the CW (continuous wave) and pulsed EPR (electron paramagnetic resonance) have been examined of the swelled Argonne Premium whole coals and the swelled residues of these coals. The CW EPR spectra will not be of high quality due to

the unexpectedly microwave-lossy character of the pyridine used for swelling. Being relatively unaffected by this characteristic, the pulsed EPR measurements of the spin relaxation times of the broad (non-inertinite) and narrow (inertinite) macerals have been completed. Although detailed analyses of these results have not yet been done, marked differences have been found between the relaxation times of the swelled and unswelled coals and residues. The most startling are the less than 200 nsec times T_1 of the spin-lattice relaxation of the inertinite radicals in the swelled samples. The T_1 of this maceral in the unswelled coal were approaching 1 millisecond. The T_1 contrast was much less pronounced between the swelled and non-swelled non-inertinite macerals. The prospects of significant progress in coal pore size measurements with xenon and NMR (nuclear magnetic resonance) have dimmed since the beginning of this project. This assessment is based on the dearth of these types of studies, a paper at a contractors' meeting on this subject that did not materialize, and discussions with colleagues with experience with the technique in coals. Instead, the authors have been developing a pulsed EPR technique for the spin probing of molecular motion to be applied to pores in carbonaceous materials. This report contains a copy of a nearly final draft of a paper being prepared on the development of this technique, entitled "Physical Characterization of the State of Motion of the Phenalenyl Spin Probe in Cation-Exchanged Faujasite Zeolite Supercages with Pulsed EPR."

11482 (DOE/PC/91303–T9) **Semiconductor electrochemistry of coal pyrite: Quarterly technical progress report, July–September 1993.** Osseo-Asare, K.; Wei, D. Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering. [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91303. Order Number DE94008379. Source: OSTI; NTIS; GPO Dep.

Pyrite (FeS_2) synthesis was studied in aqueous solution at room temperature and pressure using ferric chloride ($FeCl_3$) and sodium hydrosulfide (NaHS) as reactants, and sodium hexametaphosphate ($(NaPO_3)_6$) as dispersant, which was added in the system to control the particle size of pyrite. The effects of the reaction pH and the concentrations of the reactants and the dispersant on the characterization of pyrite were studied. The pH of the reaction determines the products of the reaction. Elemental sulfur is produced at pH 2.4. As pH increases, the reaction product becomes a mixture of elemental sulfur plus pyrite at pH 2.9. In the pH range of 3.6 to 5.7, pyrite is formed with a spherical shape and a size of 2 μm. Further increasing pH, the amorphous iron sulfides are obtained. lowering of the concentration of the reactant can decrease the particle size of pyrite only in the earlier stage of the reaction. The final particles have the same size for any initial concentration of the reactants used in the study. Addition of dispersant can change the properties of the products. The mechanism of the dispersant reaction is carrying out currently in this laboratory.

11483 (DOE/PC/92521–T67) **Characterization of available coals from Illinois mines: Final technical report, September 1, 1992–August 31, 1993.** Demir, I. (Illinois State Geological Survey, Champaign, IL (United States)); Harvey, R.D.; Ruch, R.R.; Chaven, C.; Damberger, H.H.; Steele, J.D.; Frankie, W.T. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008009. Source: OSTI; NTIS; GPO Dep.

The goal of this project was to characterize available product coals from Illinois mines. The characterization parameters that were determined include the concentration of all trace and minor elements that are of environmental concern, the pyrite size distribution and maceral association, preliminary froth flotation cleanability, slagging and fouling characteristics, chlorine forms and distribution, and certain gasification and rheology parameters. The available trace element data on Illinois coals, mainly on channel samples, was edited and updated with new records. The determinations of the trace and minor elements in 34 collected cleaned coal samples, as well as the proximate and ultimate compositions of 34 samples, were completed. In comparison with the previous channel sample data, the results indicated that the cleaning at existing preparation plants reduced the average concentrations of most of the trace elements in the coals. The data also indicated that the trace element concentrations in the product coals could be reduced further by advanced physical cleaning techniques. A sequential (hot water, dilute ammonia, and dilute sodium hydroxide) extraction procedure on three samples indicated variable chloride reductions. The pyrite cleanability index was determined microscopically for each sample. This index is a relative measure of the ease of pyrite removal from the tested sample. The froth flotation test data on 15 of the samples provided a measure of further cleanability of the product coals by physical fine coal cleaning. Viscosities of the 50% solid and <60 mesh particle size slurries of the same 15 samples revealed that these coals can be pumped in slurry form through a pipeline. Slagging and fouling indices, calculated for all 34 samples, indicated that most of the samples are of low to medium slagging and fouling types. Calculation of the gasification parameters indicated that the Illinois coals are in general amenable to gasification.

11484 (DOE/PC/92521–T68) **VHF EPR analysis of organic sulfur in coal: Final technical report, September 1, 1992–August 31, 1993.** Clarkson, R.B. (Illinois Univ., Urbana, IL (United States)); Belford, R.L. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008010. Source: OSTI; NTIS; GPO Dep.

A direct and non-destructive technique called very High Frequency Electron Paramagnetic Resonance (VHF EPR) utilizing instrumentation and application techniques developed in this laboratory, is proving to be a practical and sensitive analytical method for the organic sulfur in coal. Research during this past year (1992–1993) was very successful in terms of obtaining spectrochemical information on organic sulfur in coal both quantitatively (amount of organic sulfur) and qualitatively (form and distribution of organic sulfur). Starting in this funding year, the authors have begun to develop and use a two-species model (non-exchanging and axially symmetric) for the simulation of VHF EPR coal spectra. Such a model provides quantitative information on the total concentration of sulfur species that can be directly related to the organic sulfur content as measured by conventional chemical methods. Utilizing the newly developed method, they have analyzed the VHF EPR spectra from some sub-bituminous coals containing organic sulfur in the range from 2% to 12% and a number of maceral blends. Excellent quantitative agreement is achieved between VHF EPR results and chemical analyses. In addition, the modelling of VHF EPR spectra of coal provides detailed spectral parameters. These parameters can be related to the molecular structures of the paramagnetic species giving rise to the EPR signals, as demonstrated by our study of the model compounds. The foundation of VHF EPR analysis of aromatic sulfur radicals has been firmly established based on careful investigations of the molecular and electronic structures of the thiophenic model compounds. The results validate the theoretical soundness of the method and carry important practical implications.

11485 (DOE/PC/92521–T79) **Mass spectral study of organic sulfur in the polymeric matrix of coal: Final technical report, September 1, 1992–August 31, 1993.** Hanley, L. (Illinois Univ., Chicago, IL (United States). Dept. of Chemistry). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008021. Source: OSTI; NTIS; GPO Dep.

These experiments have attempted to examine the chemical environment of organic sulfur in the polymeric matrix of Illinois coal by laser desorption of high molecular weight fragments into an ion trap mass spectrometer. The author has found that the molecular weight distribution of pyridine extracts of Illinois No. 6 coal ranges from 150 to 1500 m/z, with a peak near 500 m/z. No compounds higher than 1500 m/z were observed. The results support the contention that solvent extracts of coal are highly aromatic in nature. However, he has shown that laser desorption mass spectrometry (LDMS) is not capable of analyzing organic sulfur in coal without the addition of liquid chromatography for preseparation. LDMS has also been used to test the validity of the maceral separation

method for the analysis of coal. Separated macerals of Ohio No. 5 coal show unique mass spectra in the low mass range, verifying that chemical differences do exist between the macerals. However, liptinite and vitrinite show similar distributions of compounds around 900 m/z which are not seen for inertite. These higher molecular weight compounds might not be detected by gas chromatography mass spectrometry (GC/MS). LDMS has also been applied to the analysis of coal gasification liquids which have been biodesulfurized by microbial methods. LDMS results indicate that biodesulfurization induces significant chemical changes in these liquids. Changes in molecular weight distributions less than 20% were also observed for some of the samples.

11486 (DOE/PC/92521–T80) **Analysis of organic sulfur and nitrogen in coal via tandem degradation methods: Final technical report, September 1, 1992–August 31, 1993.** Kruge, M.A. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Geology); Palmer, S.R. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008022. Source: OSTI; NTIS; GPO Dep.

The principal impediment to the molecular characterization of organic sulfur and nitrogen in coal is the polymeric nature of coal's molecular structure, rendering coal insoluble and impossible to analyze by the necessary gas chromatographic (GC) methods. In this research, the authors apply chemical and thermal degradation techniques to render coal amenable to standard GC characterization. IBC101 floated coal was oxidized with sodium dichromate in five sequential steps. The SIC ratio in the residues decreases markedly with each successive step. It appears the method is effectively mobilizing the organic sulfur. The NIC ratio shows little change. In the GC/MS analysis of the dichromate oxidation products, alkylmethoxy-thiophene carboxylic acids (ATCA) were found to be major organosulfur compounds. Their relative concentrations also drop markedly with each oxidation step, while the concentration of benzene derivatives progressively increases. It is hypothesized the thiophenic moieties are located on the exterior surfaces of the coal structure, while the core is more aromatic. Using analytical micropyrolysis-gas chromatography with a sulfur-selective flame photometric detector (py-GC-FPD), it is possible to easily see a full distribution of organic sulfur forms in a one-step analysis. The predominance of alkylthiophenes in the pyrolyzates lends support to the recognition of thiophenic compounds in the dichromate oxidation products. The thiophene concentrations in pyrolyzates are directly proportional to bulk organic sulfur values. However, thiophene distributions in Illinois Basin coals are remarkably similar, regardless of organic sulfur content. It is possible to distinguish Illinois Basin coals from foreign coals on the basis of thiophene distributions. The py-GC method has an advantage over oxidative degradation techniques in that it permits direct, one-step microscale analysis, requiring only a minimum of sample preparation.

11487 (DOE/PC/92521–T91) **Development of an on-line image analysis for assessment of pyrite liberation: Final technical report, 1 September, 1992–31 August, 1993.** Yen, S.C.M. (Southern Illinois Univ., Carbondale, IL (United States)); Chu, P.T.C. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008033. Source: OSTI; NTIS; GPO Dep.

The degree of pyrite liberation is a key to determine whether a batch of ground coal obtained through a grinding process is acceptable. Currently, the liberation analysis is conducted manually through a microscope with a commercial image analysis software. This procedure is very labor intensive and time consuming. As a result, an automation procedure based on the principles of image processing is proposed to perform the analysis of pyrite/minerals liberation of coal. To make the automated image analysis system possible, a data base of the light reflectance characteristics of different coal constituents must be established and implemented into a computer program. Characterization of coal images through the analysis of histograms has been conducted. To be specific, this research effort, during the past one year, has led to (1) the development of the flowchart of an on-line automated image analysis system, (2) the construction of an X-Y stage and the corresponding controlling software, (3) the development of rule based criteria from the image characteristics of coal particles, (4) the development of an image analysis computer software for analyzing coal particles without any human operator's intervention. The initial verification of this program has indicated that the automated image analysis process has met the proposed objectives.

11488 (DOE/PC/92544–6) **Vapor pressures and heats of vaporization of primary coal tars: Quarterly technical progress report, 1 October 1993–31 December 1993.** Suuberg, E.M. Brown Univ., Providence, RI (United States). Div. of Engineering. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92544. Order Number DE94008322. Source: OSTI; NTIS; GPO Dep.

The vapor pressure correlations that exist at present for coal tars are very crude and they are not considered reliable to even an order of magnitude when applied to tars. Sophisticated general correlative approaches are slowly being developed, based upon group contribution methods, or based upon some key functional features of the molecules. These are as yet difficult to apply to coal tars. The detailed group contribution methods, in which fairly precise structural information is needed, do not lend themselves well for application to very complex, poorly characterized coal tars. The methods based upon more global types of characterizations have not yet dealt much with the question of oxygenated functional groups. In short, only very limited correlations exist, and these are not considered reliable to even an order of magnitude when applied to tars. The present project seeks to address this important gap in the near term by direct measurement of vapor pressures of coal tar fractions, by application of well-established techniques and modifications thereof. The principal objectives of the program are to: (1) obtain data on the vapor pressures and heats of vaporization of tars from a range of ranks of coal, (2) develop correlations based on a minimum set of conveniently measurable characteristics of the tars, (3) develop equipment that would allow performing such measurements in a reliable, straightforward fashion.

11489 (DOE/PC/92546–T5) **New concept for coal wettability evaluation and modulation: Technical progress report, October 1, 1993–December 31, 1993.** Hu, Weibai. Utah Univ., Salt Lake City, UT (United States). [1993]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92546. Order Number DE94008325. Source: OSTI; NTIS; GPO Dep.

This project is concerned concept for coal surface wettability evaluation and modulation. The objective of the work are to study the fundamental surface chemistry feature about the evaluation of the surface of coal, pyrite and coal pyrite, and also establish a new separation strategy which could contribute to the advanced coal cleaning for premium fuel application. In this quarter, the capillary rise of three coals, colorado mineral pyrite, and coal pyrite in butanol, pentanol, and butyl ether have been tested. The test results shown that the kinetic wettability of the five samples in the alcohol homolog are dependent on the carbon chain length, as the length of the carbon chain is shorter, the surface wettability is the better. Another test results shown that the kinetic wettability of coals are better than mineral pyrite and coal pyrite in the butyl ether.

0108 Waste Management

Refer also to citation(s) 11416, 11457, 11467, 11470, 11471, 11515, 11516, 11520, 11522, 11523, 11524, 11525, 12033, 12045, 12059, 12090, 12103, 12676

11490 (DOE/MC/22118–3546) **Field study of disposed solid wastes from advanced coal processes: Annual report, October 1, 1992–September 30, 1993.** Radian Corp., Austin, TX (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC22118. Order Number DE94000071. Source: OSTI; NTIS; GPO Dep.

Radian Corporation and the North Dakota Energy and Environmental Research Center (EERC) are funded to develop information to be used by private industry and government agencies for managing solid wastes produced by advanced coal combustion

processes. This information will be developed by conducting several field studies on disposed wastes from these processes. Data will be collected to characterize these wastes and their interactions with the environments in which they are disposed. Three sites were selected for the field studies: Colorado Ute's fluidized bed combustion (FBC) unit in Nucla, Colorado; Ohio Edison's limestone injection multistage burner (LIMB) retrofit in Lorain, Ohio; and Freeman United's mine site in central Illinois with wastes supplied by the nearby Midwest Grain FBC unit. During the past year, field monitoring and sampling of the three landfill test cases constructed in 1989 were completed. Monitoring continued at Test Case Four. Two cells for Test Case Five were constructed in Illinois.

11491 (DOE/MC/24132–3635) **Tidd PFBC Demonstration Project: Quarterly report, July 1–September 30, 1993.** American Electric Power Service Corp., Columbus, OH (United States). Oct 1993. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24132. Order Number DE94004054. Source: OSTI; NTIS; GPO Dep.

This is the 26th Technical Progress Report submitted to the Department of Energy in connection with the Cooperative Agreement between the DOE and the Ohio Power Company for the Tidd PFBC Demonstration Plant. This report covers the period from July 1, 1993 to September 30, 1993. Major activities during this period include: (1) The unit was restarted on June 29, 1993 and operated for a total of 1,288 hours on coal. (2) There were eight gas turbine starts, seven bed preheater starts, and seven operating periods on coal fire. (3) During the quarter, total gross generation was 44,666 MWH, the peak unit output for one hour was 58 MWH, and coal combustion was 22,635 tons. (4) Gas turbine telemetry tests were accomplished during the first two runs of the quarter. (5) The unit demonstrated the ability to achieve 95% sulfur retention at reduced bed levels. (6) Sorbent utilization tests were conducted at various bed levels and sulfur retention values with different adsorbents. Major items planned for the next period include: (a) Continuation of sorbent utilization tests at various bed levels and sulfur retention values and with different coals and adsorbents. (b) Operation at full load.

11492 (DOE/PC/91295–T8) **A novel, integrated treatment system for coal waste waters: Quarterly report, September 2, 1993–December 1, 1993.** Wang, H.Y.; Srinivasan, K.R. Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering. [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91295. Order Number DE94008376. Source: OSTI; NTIS; GPO Dep.

The aims of this study are to develop, characterize and optimize a novel treatment scheme that would be effective simultaneously against the toxic organics and the heavy metals present in coal conversion waste waters. In this report, the following findings have been reported and discussed. Adsorption of β-naphthoic acid (NA) onto hectorite-CBDA containing different amounts of adsorbed CBDA is pH dependent, stronger at pH 4.5 and much weaker at pH 8.6. Partitioning into the hydrophobic patches of hectorite-CBDA and binding as counter ion to CBDA bilayers appear to be the dominant mechanisms of adsorption of NA to hectorite-CBDA. Anionic CR(VI) adsorbs very weakly to MONT-DT at pH 8.5 and this result verifies our earlier finding that the positive surface charge on MONT-DT decreases with increasing pH above pH 7.0. Potentiometric titrations of DT in water-isopropyl alcohol (EPA) binary solutions containing different volume fractions of IPA reveal that the pKa of DT is 7.6 $\pm$ 0.1 independent of EPA volume fraction. It is also shown that DT forms emulsions at pH lower than 4.0 and these emulsions tend to break up as pH is raised above 6.5. The formation of DT emulsions is reversible with respect to pH, but the process appears to be slow with a time constant of about 30 minutes.

11493 (DOE/PC/92119–T2) **Microbial recovery of metals from spent coal liquefaction catalysts: Quarterly report, July–September 1993.** Sandbeck, K.A.; Joffe, P.M. Geo-Microbial Technologies, Inc., Ochelata, OK (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92119. Order Number DE94007997. Source: OSTI; NTIS; GPO Dep.

The project objectives outlined in the previous reports involved defining conditions and cultures best suited to achieve the most effective metal release from spent coal liquefaction catalysts by microbial processes. The work initiated in the first quarter of 1993 was continued and expanded using solvent extraction systems defined by the multiple solvent tests used for washing the catalysts. To reduce the number of solvent systems the data were examined and two solvents selected for continued testing. The two solvent systems which were chosen and have been employed are the isopropanol and a tetrahydrofuran (THF) extractive solvents. In the present simplified extractive system, the catalysts are washed with the solvent with simple agitation to prevent catalyst breakage. Studies on the effect of catalyst surface area will be continued in conjunction with the progressive development of the optimized microbial metal releasing system. Thermophilic cultures (Bacillus stearothermophilus and Metallosphaera sedula) are being grown at 60 C for initial metal releasing studies. Since THF has proven to be a superior solvent system as judged by metal release, research has concentrated on using THF as the solvent system allowing work to proceed rapidly. However, additional work will still be directed toward defining any solvent system superior to THF in terms of aiding microbiological release of metals and economic feasibility. These studies include measurements of metal release at various catalyst-media ratios for both the tetrahydrofuran and isopropanol washed catalysts. The importance of the catalyst-media ratios is assuming a greater importance since it is desired to reduce the media volume to the lowest level possible while still retaining good metals release.

11494 (DOE/PC/92521–T74) **Geochemistry of FBC waste-coal slurry solid mixtures: Final technical report, September 1, 1992–August 31, 1993.** Dreher, G.B. (Illinois State Geological Survey, Champaign, IL (United States)); Roy, W.R.; Steele, J.D.; Heidari, M. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008016. Source: OSTI; NTIS; GPO Dep.

The three tasks conducted in this research project were related to understanding the geochemistry and mineralogy of the co-disposal of fluidized bed combustion (FBC) wastes with coal slurry solid (CSS) from a coal preparation plant. During coal cleaning, pyrite, other heavy minerals and rock fragments are separated from the coal and discharged in an aqueous slurry to an impoundment. After dewatering and closure of the impoundment, the pyrite can oxidize and produce acid that can migrate into the underlying groundwater system. The addition of FBC residue to the CSS will buffer the pore water pH to approximately 7.8. In Task 1, soluble components and acid-base react ion products from mixtures of FBC waste and CSS were extracted for 3 to 180 days in aqueous batch experiments. The results of these extractions showed that, eventually, the extracts would attain a pH between 7 and 8. That pH range is characteristic of an aqueous system in equilibrium with calcite, gypsum, and atmospheric carbon dioxide. After 180 days, the mean calcium concentration in all of the extracts was 566$\pm$18 mg/L and sulfate concentrations averaged 2420$\pm$70 mg/L. In Task 2, three extracts from CSS/FBC residue mixtures were prepared for use in experiments to determine the adsorption/desorption reactions that occur between solutes in the extracts and two common Illinois soils. Time constraints allowed the use of only two of the extracts for adsorption studies. The concentrations of most solutes were not significantly lowered by adsorption at the pH of the extract-soil suspension, nor over a wide range of pH. The results suggest that the type of solutes that were released by the CSS/FBC residue mixture would not be attenuated by adsorption. In a modified Task 3, the literature on the kinetics of pyrite oxidation in near-neutral to alkaline pH was reviewed in preparation for future development of a computer model of pyrite oxidation in CSS/FBC residue codisposal.

11495 (DOE/PC/92521–T75) **Recovery and utilization of gypsum and limestone from scrubber sludge: Final technical report, September 1, 1992–August 31, 1993.** Kawatra, S.K. (Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering); Eisele, T.C. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United

States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008017. Source: OSTI; NTIS; GPO Dep.

Wet flue-gas desulfurization units in coal-fired power plants produce a large amount of sludge which must be disposed of, and which is currently landfilled in most cases. Increasing landfill costs are gradually forcing utilities to find other alternatives. In principle, this sludge can be used to make gypsum ($CaSO_4 \cdot 2H_2O$) for products such as plaster-of-Paris and wallboard, but only if impurities such as unreacted limestone and soluble salts are removed, and the calcium sulfite ($CaSO_3$) is oxidized to calcium sulfate ($CaSO_4$). This project investigated methods for removing the impurities from the sludge so that high-quality, salable gypsum products can be made. Two processes were studied, both separately and in combination: Water-only cycloning, and froth flotation. A large fraction (30–40%) of the impurities in the sludge are contained in the coarser, higher-density particles, which are readily removed using a water-only cyclone. Much of the remaining impurities are hydrophobic, and can be removed by froth flotation. A combined cyclone/froth flotation process has been found to be suitable for producing a high-purity product from scrubber sludge at low cost.

11496 (DOE/PC/92521–T77) **Microbial stabilization of sulfur-laden sorbents: Final technical report, September 1, 1992–August 31, 1993.** Miller, K.W. (Illinois State Univ., Normal, IL (United States)); Hillyer, D. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008019. Source: OSTI; NTIS; GPO Dep.

Clean coal technologies that involve limestone for sulfur capture generate lime/limestone products laden with sulfur at various oxidation states. If sulfur is completely stabilized as sulfate, the spent sorbent is ready for commercial utilization as gypsum. However, the presence of reduced sulfur species requires additional processing. Thermal oxidation of reduced sulfur can result in undesirable release of SO_2. Microbial oxidation might provide an inexpensive and effective alternative. Sorbents laden with reduced forms of sulfur such as sulfide or sulfite can serve as growth substrates for sulfur-oxidizing bacteria, which convert all sulfur to sulfate. The goals of this project are the following: (1) to optimize conditions for sulfate generation from sulfide, thiosulfate, and sulfite; (2) to test and optimize the effectiveness of microbial processing on spent sorbents from flue gas desulfurization, coal gasification, and fluidized bed combustion; (3) to search for hyperalkalinophilic thiobacilli, which would be effective up to pH 11.

11497 (DOE/PC/92521–T94) **Plasma-assisted cleanup of flue gas: Final technical report, 1 September, 1992–31 August, 1993.** Dhali, S.K. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Electrical Engineering). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008036. Source: OSTI; NTIS; GPO Dep.

The objective of the proposed research is to design and implement a novel scheme for the combined removal of SO_2 and NO_x using a dielectric-barrier discharge in conjunction with UV irradiation. This investigation requires the design of a dielectric-barrier reactor and testing the proposed scheme under different conditions that exist in a flue gas. A reactor has been designed and electrical tests have been performed. The voltage characteristics of the plasma reactor has been studied. The authors have found that a discharge can be sustained at atmospheric pressures with a large inner electrode in the coaxial configuration. The testing of the uniformity of the discharge with UV irradiation has been very successful. The details are provided in this report and have been submitted to the Applied Physics Letter. Also both experimental and simulation work were carried out on the removal of SO_2 and NO_x. With the improved reactor, they have achieved a conversions of SO_2 up to 85%. The simulation studies indicate that complete removal of NO_x is possible at reduced electric fields (E/N) of above 100 Td.

11498 (DOE/PC/92521–T95) **An attrition-resistant zinc titanate sorbent for sulfur: Final technical report, September 1, 1992–August 31, 1993.** Swisher, J.H. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008037. Source: OSTI; NTIS; GPO Dep.

In the continuing search for good sorbent materials to remove sulfur for hot, coal-derived gases, zinc titanate sorbents have shown great promise. The objective of this project was to extend the work of prior investigators by developing improvements in the compressive strength and, therefore, the cycle life of these sorbents while maintaining good chemical reactivity. Fifteen formulations were prepared and evaluated. The best properties were obtained by blending relatively course (two micron) ZnO and TiO_2 powders to obtain a composition of $50\%Zn_2TiO_4$-$50\%TiO_2$. When sintered at 1000°C, it had a compressive strength of 28 MPa or 147 N/mm, which is four times higher than values obtained by prior investigators. It also performed well in thermogravimetric analysis measurements of reactivity, both in screening tests and in simulated coal gas.

11499 (DOE/PC/92521–T97) **Removal of CO_2 from flue gases by algae: Final technical report, September 1, 1992–August 31, 1993.** Akin, C. (Inst. of Gas Technology, Chicago, IL (United States)); Maka, A.; Patel, S.; Conrad, J.; Benemann, J. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008039. Source: OSTI; NTIS; GPO Dep.

The objective of this research program is to determine the feasibility of the alga Botryococcus braunii as a biocatalyst for the photosynthetic conversion of flue gas CO_2 to hydrocarbons. Free and immobilized cells of Botryococcus braunii were grown in aqueous medium supplemented with nitrogen, phosphorus and mineral nutrients. Air and CO_2 enriched air [10% to 15% (V/V) CO_2] in the gas phase and 0.2% to 2% $NaHCO_3$ in the liquid medium served as the carbon source. Growth and hydrocarbon formation characteristics of free and immobilized cultures of Botryococcus braunii were determined in bench-scale photobioreactors. Technical and economic feasibility of the conversion of flue gas CO_2 to hydrocarbons by Botryococcus braunii culture systems was evaluated. In free cell systems, the hexane extractable oil productivity was about 15 to 37 grams of oil per 100 grams of cell dry weight. In immobilized cell systems, the oil production ranged between 5% and 47% at different immobilization systems and immobilized surface locations, with an average of 19% of cell biomass dry weight. The feasibility and economic evaluation estimated the cost of oil produced from flue gas CO_2 by algae to range between $45 and $75 per barrel assuming that a hydrocarbon yield of about 50% of the biomass weight is achievable and a credit of $60 per ton of carbon removed is available. A future research program leading to development of a multistage process, consisting of closed systems for heavy inoculum buildup followed by lower cost open systems for oil production is recommended.

11500 (DOE/PC/92521–T98) **Stabilization of spent sorbents from coal gasification: Final technical report, September 1, 1992–August 31, 1993.** Abbasian, J. (Institute of Gas Technology, Chicago, IL (United States)); Hill, A.H.; Rue, D.M.; Wangerow, J.R. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008040. Source: OSTI; NTIS; GPO Dep.

The objective of this investigation was to determine the rates of reactions involving partially sulfided dolomite and oxygen, which is needed for the design of the reactor system for the stabilization of sulfide-containing solid wastes from gasification of high sulfur coals. To achieve this objective, samples of partially sulfided dolomite were reacted with oxygen at a variety of operating conditions in a fluidized-bed reactor. The effect of external diffusion was eliminated by using small quantities of the sorbent and maintaining a high flow rate of the reactant gas. The reacted sorbents were analyzed to determine the extent of conversion as a function of operating variables including sorbent particle size, reaction temperature and pressure, and oxygen concentration. The results of

sulfation tests indicate that the rate of reaction increases with increasing temperature, increasing oxygen partial pressure, and decreasing sorbent particle size. The rate of the sulfation reaction can be described by a diffuse interface model where both chemical reaction and intraparticle diffusion control the reaction rate. The kinetic model of the sulfation reaction was used to determine the requirements for the reactor system, i.e., reactor size and operating conditions, for successful stabilization of sulfide-containing solid wastes from gasification of high sulfur coals (with in-bed desulfurization using calcium based sorbents). The results indicate that the rate of reaction is fast enough to allow essentially complete sulfation in reactors with acceptable dimensions. The optimum sulfation temperature appears to be around 800°C for high pressure as well as atmospheric stabilization of the spent sorbents.

0109 Environmental Aspects

Refer also to citation(s) 11404, 11405, 11406, 11407, 11408, 11409, 11410, 11411, 11412, 11420, 11490, 11494, 11503, 11509, 11512, 12038, 12039, 12040, 12041, 12055, 12056, 12058, 12415

11501 (CONF-9309152–Vol.1, pp. 227-242) **Demonstration of selective catalytic reduction technology for the control of nitrogen oxide emissions from high-sulfur, coal-fired boilers.** Hinton, W.S. (Southern Company Services, Birmingham, AL (United States)); Powell, C.A.; Maxwell, J.D. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper describes the status of the Innovative Clean Coal Technology project to demonstrate SCR technology for reduction of NOx emissions from flue gas of utility boilers burning U.S. high-sulfur coal. The funding participants are the U.S. Department of Energy (DOE), Southern Company Services, Inc. (SCS), on behalf of the entire Southern Company, Electric Power Research Institute (EPRI), and Ontario Hydro. SCS is the participant responsible for managing all aspects of the project. The project is being conducted on Gulf Power Company's Plant Crist Unit 5 (75-MW nominal capacity), located near Pensacola, Florida, on U.S. coals that have a sulfur content near 3.0%. The SCR facility treats a 17,400 scfm slip-stream of flue gas and consists of three 2.5-MW (5000 scfm) and six 0.2-MW (400 scfm) SCR reactors. The reactors operation in parallel with commercially available SCR catalysts obtained from vendors throughout the world. The design engineering and construction have been completed, and the start-up/shakedown was completed in June 1993. Long-term performance testing began in July 1993 and will be conducted for two years. Test facility description and test plans, as well as start-up issues and preliminary commissioning test results are reported in this paper.

11502 (DOE/MC/10637–3618) **Nitrous oxide emissions: Topical report, July 1, 1990–June 30, 1993.** Collings, M.E.; Mann, M.D. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Dec 1993. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC10637. Order Number DE94004059. Source: OSTI; NTIS; GPO Dep.

Published N_2O emissions data for experimental studies examining large numbers of coals are generally scarce at the pilot-scale fluidized-bed combustion (FBC) level, although some data are available at the laboratory scale. The primary objective of this study was to determine the atmospheric contribution of N_2O derived from coal combustion. Additionally, the goal was to establish a comprehensive engineering model to assist in the prediction of N_2O emissions based upon operating and design considerations. To meet the overall objectives of determining the overall contribution of N_2O derived from FBC and developing an engineering model seven tasks were originally proposed. The objective of each task as originally proposed and finally executed is presented in this topical report. The seven tasks were: (1) literature survey; (2) equipment design and test plan development; (3) experimental techniques; (4) pilot-scale determination of the impacts of coal properties and operating conditions on N_2O emissions; (5) role of coal char on N_2O formation and destruction; (6) homogeneous versus heterogeneous reactions; and (7) modeling of N_2O emissions.

0110 Reserves, Geology, and Exploration

Refer also to citation(s) 11477, 11586

11503 (CONF-9309152–Vol.1, pp. 9-27) **Plenary Session 1.** Yeager, K.E. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The discussion in Plenary Session 1 are presented in outline form. The following topics were discussed: Energy consumption/GNP vs. electricity use; change drivers; evolving industry structure; customer incentives are significant; percent of generating capacity; $\geq$ 30 years of age; economic growth; annual GNP growth rates; electricity load growth/economic growth; rates of electricity demand growth; average national electricity price trends; sustainability; alternative futures for electricity generation; prospects and electric energy; fossil fuel recoverable reserves; and evaluation of world energy utilization.

11504 (DOE/EIA–0576) **State coal profiles, January 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. 2 Feb 1994. 130p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007086. Source: OSTI; NTIS; GPO; GPO Dep.

The purpose of State Coal Profiles is to provide basic information about the deposits, production, and use of coal in each of the 27 States with coal production in 1992. Although considerable information on coal has been published on a national level, there is a lack of a uniform overview for the individual States. This report is intended to help fill that gap and also to serve as a framework for more detailed studies. While focusing on coal output, State Coal Profiles shows that the coal-producing States are major users of coal, together accounting for about three-fourths of total US coal consumption in 1992. Each coal-producing State is profiled with a description of its coal deposits and a discussion of the development of its coal industry. Estimates of coal reserves in 1992 are categorized by mining method and sulfur content. Trends, patterns, and other information concerning production, number of mines, miners, productivity, mine price of coal, disposition, and consumption of coal are detailed in statistical tables for selected years from 1980 through 1992. In addition, coal's contribution to the State's estimated total energy consumption is given for 1991, the latest year for which data are available. A US summary of all data is provided for comparing individual States with the Nation as a whole. Sources of information are given at the end of the tables.

11505 (DOE/PC/79997–1) **Establishment and maintenance of a coal sample bank and data base: Final report, April 8, 1988–September 28, 1993.** Davis, A.; Glick, D.C. Pennsylvania State Univ., University Park, PA (United States). Coal and Organic Petrology Labs. Nov 1993. 264p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC79997. Order Number DE94005619. Source: OSTI; NTIS; GPO Dep.

This DOE contract continued support for the DOE Coal Sample Bank and Data Base at Penn State. At the beginning of the contract, a new type of container was evaluated for long-term storage of coal samples ranging in quantity from a few grams to over 10 kg (22 lbs). Gieseler fluid behavior, oxidation of pyrite to sulfates, loss of heating value, and other properties were monitored over time. Based on preliminary results, these foil and polyethylene laminate bags were believed to be a significant improvement over the drums, buckets and cans previously used. Use of the bags was therefore instituted with DECS-1, the first sample collected under the contract. Twenty-two DECS samples were collected, ranging in rank from lignite to anthracite and representing the five most productive coal provinces of the US. Over 6500 containers of DECS samples were created under the contract and 750 containers of 34 PSOC samples are supported by the contract. Each sample was

characterized by proximate and ultimate analysis, petrographic (vitrinite reflectance and maceral) analysis, physical and thermoplastic testing, and inorganic element analysis. The resulting data, and geologic data on each sample, were entered in a data base which can be used to produce a formatted five-page or one-page printout for each sample. An interactively operated data base can be searched, sorted or summarized to produce tables of selected data or to identify samples meeting a requestor's criteria. During the period covered, 2,313 printouts, and 204 special data reports resulting in distribution of data on 34,086 samples, were provided on request.

0120 Mining

Refer also to citation(s) 11418, 11504

11506 (DOE/EIA–0121(93/3Q)) **Quarterly coal report, July–September 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. 18 Feb 1994. 171p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007370. Source: OSTI; NTIS; GPO; GPO Dep.

The Quarterly Coal Report (QCR) provides comprehensive information about US coal production, distribution, exports, imports, receipts, prices, consumption, and stocks to a wide audience, including Congress, Federal and State agencies, the coal industry, and the general public. Coke production, consumption, distribution, imports, and exports data are also provided. The data presented in the QCR are collected and published by the Energy Information Administration (EIA) to fulfill data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (Public Law 93-275), as amended.

11507 (KTM/E-B–156) **OPTIMITURVE - Peat production based on solar energy: Final report on the energy research programme 1988-1992.** Leinonen, A. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.); Erkkilae, A. Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. 1993. 128p. (In Finnish). Project KTM-275/881/87. Order Number DE94721997. Source: OSTI; NTIS.

OPTIMITURVE Research Programme.

The aim of the Optimiturve research programme was to develop a peat production method based on solar energy, the efficiency and the profitability of which would be twice as high as those of previous methods. Due to the efficiency, which means a higher peat yield per hectare, the circulation of the capital invested in peat production increases and further boosts the competitiveness of peat. It was calculated that if the target of the research programme can be fulfilled, peat production costs could be reduced by 20 %. The total budget of the programme amounted to 44,3 million FIM. Basic knowledge for ditching of the bog, drying of milled peat, milling, pneumatic harvesting, drying of sod peat, maceration and excavation have been developed in the course of the Optimiturve research programme. Additionally, peat production planning and control have been studied and developed. A new milled peat production method, the so called TEHOTURVE method, and a new combined production method for milled and sod p:at, the MULTI method, have been developed on this basis. The guiding principle of the TEHOTURVE method is that the average grain size of the milled layer to be dried increased from 5 mm to 15 mm and the collection coefficient of the ridger increased from 50 % to 80 %. Ridging of several harvests on the same ridge, efficient loading and driving are also typical of the method. The MULTI method is a combined production method for milled and sod peat. The method is based on sod peat production using the ridge drying method (TUPLA), in which two harvests are produced simultaneously. The first harvest is dried on the field and the other on the ridge.

11508 (NEI-FI–219) **Potential large-scale targets of use of peat from the point of view of peat production.** Peronius, P.; Rissanen, J.; Ilola, M. Suo Oy, Oulu (Finland). 1993. 124p. (In Finnish). Project KTM-15/881/91; KTM-494/881/92. Order Number DE94722029. Source: OSTI; NTIS.

SULA Research Programme.

The objective of the study was to make a survey of potential large-scale targets of use of energy peat in Finland. The minimum quantity of use was defined as 2 million MWh per year. The study made use of the existing peat research material of the Geological Survey of Finland and Vapo Oy. On the basis of the research carried out an evaluation was made on the qualitative applicability and adequacy in peat production of the peat in the reported areas. When estimating the adequacy of pact supplies for potential new plants special attention was paid on guaranteeing the fuel maintenance of the existing peat-burning plants in the area and the reported special demands on peat production caused by the environment. The economic profitability of the use of peat was calculated in the case of the most potential targets of use. The most significant unexploited peat supplies are situated in the provinces of Vaasa, Pohjois-Karjala, Oulu and Lappi. The potential localities of the plants chosen in the study were Veteli in the Province of Vaasa, Ilomantsi and Tohmajaervi in the Province of Pohjois-Karjala, Pudasjaervi and Oulujokilaakso (the valley of the river Oulu) in the Province of Oulu, and the area Rovaniemi-Ranua and Kittilae in the Province of Lappi (Lapland).

11509 (OY/PSTL-RR–112) **Valuing environmental effects of the fuel-peat chain.** Ahonen, A.; Leiviskae, V. Oulu Univ. (Finland). Research Inst. of Northern Finland. 1993. 71p. (In Finnish). Order Number DE94722021. Source: OSTI; NTIS; INIS.

SIHTI Research Programme.

An evaluation is made of the environmental effects of the fuel-peat chain in terms of their monetary costs to society. The fuel-peat chain is based on a 60/120 MW peat-fuel power plant. The plant generates heat and electricity 1080 GWh/year and uses 1,367 mill. m^3 of peat and 2227 tons of oil annually. Environmental costs are estimated to be about 8,8 mill. FIM/year or 8 FIM/MWh. Greenhouse gases accounted for 70 % of environmental costs. Estimated environmental costs are 15 % of fuel costs. Some effects particularly characteristic to fuel-peat, like the effects of peat-dust and noise, aesthetic impacts of peat production sites and adverse effects to reindeer management have not been included.

11510 (SAND–93-2566C) **A numerical study of bench blast row delay timing and its influence on percent-cast.** Preece, D.S. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940506–2: 8. international conference on computer methods and advances in geomechanics, Morgantown, WV (United States), 22-28 May 1994). Order Number DE94003105. Source: OSTI; NTIS; GPO Dep.

The computer program, DMC (Distinct Motion Code), which was developed for simulating the rock motion associated with blasting, has been used to study the influence of row delay timing on rock motion. The numerical simulations correspond with field observations in that very short delays (< 50ms) and very long delays (> 300ms) produce a lower percent-cast than a medium delay (100 to 200 ms). The DMC predicted relationship between row delay timing and percent-cast is more complex than expected with a dip in the curve where the optimum timing might be expected. More study is required to gain a full understanding of this phenomenon.

11511 (VTT-TIED–1494) **The greenhouse effects of peat production and use compared with coal, oil, natural gas and wood.** Hillebrand, K. (Technical Research Centre of Finland, Espoo (Finland). Combustion of Thermal and Engineering Lab.). Technical Research Centre of Finland, Espoo (Finland). 1993. 60p. Order Number DE94722024. Source: OSTI; NTIS.

This paper examines the effects of greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) arising from certain chains of peat production and use and compares them with the corresponding effects due to the chains of energy production and use for coal, oil, natural gas and wood. In order to estimate the greenhouse effects of the chains of peat production and use, the factors studied were the initial state of the peat bog together with the instantaneous and cumulative greenhouse effects associated with the production and fuming of peat as well as subsequent use of the production area. The burning of peat, like other fuels, brings about a strong instantaneous green-house effect which diminishes in accordance with the extent to which the greenhouse gases generated by combustion are removed from the atmosphere. Utilizing a forest-drained bog or cultivated peatland or peat production purposes as well as afforestation, turning a production area back into

a bog or creating a lake may compensate for part of the greenhouse effect caused by burning peat. In the short term the smallest cumulative green-house effect is caused by the chain of natural gas production and use. At the hundred year mark the chains of natural gas and wood production and use lead to a greenhouse effect of equal size. The short-term cumulative greenhouse effect brought about by the chain of peat production and use is equal in size to that associated with coal and oil, amounting to about 1.5 times the size of the cumulative greenhouse effect produced by wood and natural gas. In the long term the cumulative greenhouse effects of wood and, in certain chains under examination, of peat to start to diminish, while those brought about by the chains of coal, oil and natural gas production and use continue to increase.

0130 Transport, Handling, and Storage

11512 (CONF-9309152–Vol.1, pp. 449-466) **Blast furnace granular coal injection.** Kwasnoski, D. (Bethlehem Steel Corp., Bethlehem, PA (United States)); Walter, L.L. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

A blast furnace coal injection system will be constructed and tested on large high productivity blast furnaces at the Burns Harbor plant of the Bethlehem Steel Corporation. This project will demonstrate injection facilities on two blast furnaces and will permit a comparison of operation with both granular (coarse) and pulverized (fine) coal injection. Injection rates up to 400 lbs/ton hot metal will be demonstrated with a variety of domestic coal types. With the completion of the National Environmental Policy Act (NEPA) process and issuance of a construction/air permit from the State of Indiana, the project has moved into the detailed design and construction stage with commissioning scheduled for early 1995.

11513 (DOE/MC/26308–3647) **CE IGCC repowering project: Bins and lockhoppers: Topical report, 1 January, 1992–28 February, 1993.** Combustion Engineering, Inc., Windsor, CT (United States). Oct 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004067. Source: OSTI; NTIS; GPO Dep.

CE is participating in a coal gasification combined cycle repowering project that will provide a nominal 65 MW of electricity to City, Water, Light and Power (CWL and P) in Springfield, Illinois. The IGCC system will consist of CE's air-blown pressurized entrained flow two-stage gasifier; an advanced hot gas cleanup system; a combustion turbine adapted to use low-btu gas; and all necessary coal handling equipment. The coal feed system will utilize a unique high pressure lockhopper system to allow dry delivery of pulverized coal to the gasifier. A similar high pressure, high temperature lockhopper system will also be used to recycle char from the product gas stream back to the gasifier to maximize carbon utilization. This Topical Report describes the current state of design for the bins and lockhoppers to be used for the coal and char feed system. The project is currently in the second budget period of five. The major activities during this budget period are: establishment of approved for design (AFD) engineering package; development of a detailed cost estimate; resolution of project business issues; CWL and P renewal and replacement activities; and application for environmental air permits.

11514 (DOE/PC/91297–T4) **A computational model for coal transport and combustion: Quarterly technical progress report, September 1, 1993–November 30, 1993.** Ahmadi, G. Clarkson Univ., Potsdam, NY (United States). Dept. of Mechanical and Aeronautical Engineering. [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91297. Order Number DE94008006. Source: OSTI; NTIS; GPO Dep.

In the period of September 1, 1993 to November 30, 1993, further progress was made of the theoretical and computational modeling of turbulent two-phase flows, as well as granular flows. The effect of bumpy wall on flow of granular materials was also analyzed. The special case of Couette flow was studied. Further progress was made in the experimental study of mono-layer simple shear flow device. Preliminary data concerning the sharing of 12 mm multi-color glass particles are obtained. The preliminary experimental data show the expected variation. A detailed progress report for project review was also prepared which includes the recent development. The description of this report is given.

0140 Combustion

Refer also to citation(s) 11452, 11466, 11491, 11501, 11502, 11509, 11511, 11514, 11986, 11987, 11989, 11990, 11991, 11992, 11993, 11994, 11995, 12003, 12029, 12033, 12037, 12038, 12039, 12040, 12041, 12042, 12055, 12056, 12057, 12058, 12059, 12060

11515 (CONF-9309111–6) **Subsystem selection for advanced low emission boiler system.** Rodgers, L.W. (Babcock & Wilcox, Alliance, OH (United States). Research and Development Div.); Farthing, G.A.; Gorrell, R.L. Babcock and Wilcox Co., Alliance, OH (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92160. From 10. annual international Pittsburgh coal conference: coal - energy and the environment; Pittsburgh, PA (United States); 20-24 Sep 1993. Order Number DE94006988. Source: OSTI; NTIS; GPO Dep.

In 1992 the Pittsburgh Energy Technology Center (PETC) initiated a new program called Combustion 2000. The purpose of the program was to address the design issues facing new and replacement coal-fired power plants. The work presented in this paper was conducted under the low-emission boiler system (LEBS) portion of the program. LEBS major goals are: NO_x - No more than 0.20 lbs per million Btu of fuel input firing bituminous coal; SO_x – no more than 0.2 lbs of SO_2 per million Btu firing coal with at least 3 lbs of sulfur per million btu; Particulate – no more than 0.015 lbs per million Btu of fuel input; Waste and Air Toxics – reduced; and Plant Efficiency – no less than 38%. Other objectives include reducing waste generation, producing usable by-products, improving ash disposability, and increasing plant thermal efficiency while keeping the cost of electricity comparable to a state-of-the-art plant. The Babcock and Wilcox Company has completed the first year of work toward the development of an advanced low-emission boiler system (LEBS). The results of this work have led to a preliminary engineering design and a plan to address remaining technical uncertainties. This was accomplished by conducting a thorough technical assessment and performing a concept selection analysis. A summary of the results of this work is presented in this paper.

11516 (DOE/MC/23167–3527) **Advanced coal-fueled gas turbine systems: Subscale combustion testing: Topical report, Task 3.1.** Textron, Inc., Everett, MA (United States). Textron Defense Systems; Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit. May 1993. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC23167. Order Number DE94000052. Source: OSTI; NTIS; GPO Dep.

This is the final report on the Subscale Combustor Testing performed at Textron Defense Systems' (TDS) Haverhill Combustion Laboratories for the Advanced Coal-Fueled Gas Turbine System Program of the Westinghouse Electric Corp. This program was initiated by the Department of Energy in 1986 as an R&D effort to establish the technology base for the commercial application of direct coal-fired gas turbines. The combustion system under consideration incorporates a modular staged, rich-lean-quench, Toroidal Vortex Slogging Combustor (TVC) concept. Fuel-rich conditions in the first stage inhibit NO_x formation from fuel-bound nitrogen; molten coal ash and sulfated sorbent are removed, tapped and quenched from the combustion gases by inertial separation in the second stage. Final oxidation of the fuel-rich gases, and dilution to achieve the desired turbine inlet conditions are accomplished in the third stage, which is maintained sufficiently lean so that here, too, NO_x formation is inhibited. The primary objective of this work was to verify the feasibility of a direct coal-fueled combustion system for combustion turbine applications. This has been accomplished by the design, fabrication, testing and operation of a subscale development-type coal-fired combustor. Because this was a complete departure from present-day turbine combustors and fuels, it was considered necessary to make a thorough evaluation of

this design, and its operation in subscale, before applying it in commercial combustion turbine power systems.

11517 (DOE/MC/23167–3636) **Advanced coal-fueled gas turbine systems: Quarterly report, January–March 1993.** Westinghouse Electric Corp., Orlando, FL (United States). Jul 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC23167. Order Number DE94004055. Source: OSTI; NTIS; GPO Dep.

All scheduled tests for the slagging combustor program were completed prior to this reporting period. The draft topical report for the slagging combustor testing was begun in January and the draft submitted to DOE/METC for review in March. Work was completed on the (Advanced Turbine Systems) Phase 1 program and the draft topical begun in January. The ATS Phase 1 draft topical report was submitted to DOE/METC in March. Comments to the report were received back from METC prior to the end of March allowing for the preparation of the final version of the report to begin. Conceptual design of a combustion turbine system that can be integrated in a pressurized fluidized bed combustor (PFBC) application was completed at the end of March. An intermediate design review was held in February with METC and a draft of the topical report was begun during the reporting period. Details of the individual subtask work for the first generation PFBC combustion turbine system conceptual design are discussed in the "Generic Turbine Design Study Final Report" which was issued June 1993 to DOE/METC.

11518 (DOE/MC/24132–3633) **Tidd PFBC Demonstration Project: Quarterly report, April 1–June 30, 1993.** American Electric Power Service Corp., Columbus, OH (United States). Jul 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-87MC24132. Order Number DE94004052. Source: OSTI; NTIS; GPO Dep.

This is the 25th Technical Progress Report submitted to the Department of Energy in connection with the cooperative agreement between the DOE and the Ohio Power Company for the Tidd PFBC Demonstration Plant. This report covers the period from April 1, 1993 to June 30, 1993. Major activities during this period involve: (1) The unit has been out of service since early February due to the failure of the gas turbine. The gas turbine was repaired during this quarter and unit was started on June 29, 1993. (2) The unit was operated for a total of 32 hours (including gas turbine air prewarming). There were three gas turbine starts, two bed preheater starts, and one operating period with coal fire. The peak gross output of 13 MWH was achieved for the period of 2200 to 2300 hours on June 30, 1993. (3) During the quarter, total gross generation was 75 MWH, and coal consumption was 107 tons. (4) New individual ash lines from cyclones to the economizer were installed. (5) New sparge ducts were installed along with sparge duct end fluidization piping and valves. (6) Expansion joint heaters and insulation for hot gas clean-up system were installed. Major items planned for the next period include: installation of SO_2 analyzer equipment, and continuation with the operation and testing of the unit after all the current GT problems are resolved.

11519 (DOE/PC/91308–9) **Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, 15 September, 1993–14 December, 1993.** Queiroz, M.; Webb, B.W. Brigham Young Univ., Provo, UT (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91308. Order Number DE94007995. Source: OSTI; NTIS; GPO Dep.

This report describes recent progress in a fundamental, three-year investigation of the coupled problem of turbulent particle dispersion and thermal radiation transport. The project's objective is to make measurements of particle size, velocity, number density, temperature and wall radiant heat flux in a parametrically-controlled reactor presently existent at Brigham Young University (BYU). Although the study proposed here is primarily designed to provide experimental data not currently available for the evaluation of turbulent particle dispersion and radiation models, comparisons of analytical predictions and the experimental data obtained will be performed, using appropriate submodels integral to comprehensive pulverized-coal combustion codes existent at BYU. Progress has been made in the following areas: (1) reduction of experimental data recently collected; (2) particle dispersion and radiation modeling.

11520 (DOE/PC/92159–T3) **Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 4, July–September 1993.** Combustion Engineering, Inc., Windsor, CT (United States). 29 Dec 1993. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92159. Order Number DE94008008. Source: OSTI; NTIS; GPO Dep.

The overall objective of the Project is the expedited commercialization of advanced coal-fired low-emission boiler systems. The specified primary objectives are: NOx emissions not greater than one-third NSPS; SOx emissions not greater than one-third NSPS; and particulate emissions not greater than one-half NSPS. The specific secondary objectives are: improved ash disposability and reduced waste generation; reduced air toxics emissions; and increased generating efficiency. The final deliverables are a design data base that will allow future coal-fired power plants to meet the stated objectives and a preliminary design of a commercial generation unit.

11521 (DOE/PC/92162–T3) **The development of coal-based technologies for Department of Defense Facilities: Semiannual technical progress report, March 28, 1993–September 27, 1993.** Miller, B.G. (Pennsylvania State Univ., University Park, PA (United States). Energy and Fuels Research Center); Morrison, J.L.; Sharifi, R. Consortium for Coal-Water Slurry Fuel Technology, University Park, PA (United States). 17 Dec 1993. 153p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract FC22-92PC92162. Order Number DE94008324. Source: OSTI; NTIS; GPO Dep.

The US DOD, through an Interagency Agreement with the US DOE, has initiated a three-phase program with the Consortium for Coal-Water Slurry Fuel Technology, with the aim of decreasing DOD's reliance on imported oil by increasing its use of coal. The program is being conducted as a cooperative agreement between the Consortium and DOE and the first phase of the program is underway. A team of researchers has been assembled from Penn State, ABB Combustion Engineering Systems (CE), AMAX Research and Development Center (AMAX), and Energy and Environmental Research Corporation (EER). These four organizations are the current members of the Consortium. Phase 1 activities are focused on developing clean, coal-based combustion technologies for the utilization of both micronized coal-water slurry fuels (MCWSFs) and dry, micronized coal (DMC) in fuel oil-designed industrial boilers. Phase 2 research and development activities will continue to focus on industrial boiler retrofit technologies by addressing emissions control and pre-combustion strategies for the utilization of high ash, high sulfur coals. Phase 3 activities will examine coal-based fuel combustion systems that cofire wastes. Each phase includes an engineering cost analysis and technology assessment. The activities and status of Phase 1 are described in this report. The objective of Phase 1 is to deliver fully engineered retrofit options for a fuel oil-designed watertube boiler located on a DOD installation to fire either MCWSF or DMC. This will be achieved through a program of the following tasks: (1) Coal Beneficiation and Preparation; (2) Combustion Performance Evaluation; (3) Engineering Design; (4) Engineering and Economic Analysis; and (5) Final Report/Submission of Design Package. Miscellaneous activities are reported. Activities planned for the next semiannual period are listed. The project schedule, with a description of milestones, is included.

11522 (DOE/PC/92521–T69) **Behavior of sulfur and chlorine in coal during combustion and boiler corrosion: Final technical report, 1 September, 1992–31 August, 1993.** Chou, C.L. (Illinois State Geological Survey, Champaign, IL (United States)); Hackley, K.C.; Cao, J.; Moore, D.M.; Xu, J.; Ruch, R.R.; Pan, W.P.; Upchurch, M.L.; Cao, H.B. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008011. Source: OSTI; NTIS; GPO Dep.

The goals of this project are to investigate the behavior of sulfur and chlorine during pyrolysis and combustion of Illinois coals, the chemistry and mineralogy of boiler deposits, the effects of combustion gases on boiler materials, and remedial measures to reduce the sulfur and chlorine compounds in combustion gases. Replicate determinations of chlorine and sulfur evolution during coal pyrolysis-gas combustion were conducted using a pyrolysis apparatus in conjunction with a quadrupole gas analyzer. HCl is the only gaseous chlorine species measured in combustion gases. Pyrolysis of coal IBC-109 spiked with NaCl solution shows a strong peak of HCl evolution above 700C. The absence of this peak during pyrolysis of Illinois coal indicates that little chlorine in Illinois coal occurs in the NaCl form. Evolution of sulfur during coal pyrolysis was studied; the sulfur evolution profile may be explained by the sulfur forms in coal. To determine the fate of sulfur and chlorine during combustion, a set of six samples of boiler deposits from superheater and reheater tubes of an Illinois power plant was investigated. Scanning electron microscopy shows microscopic calcium sulfate droplets on cenospheres. Superheater deposits are high in mullite, hematite, and cristobalite, whereas a reheater deposit is enriched in anhydrite. The chlorine content is very low, indicating that most of the chlorine in the feed coal is lost as volatile HCl during he combustion process. The profiles of SO_2 released during combustion experiments at 825 C indicate that calcium hydroxide added to the coal has a significant effect on reducing the SO_2 vapors in combustion gases.

11523 (DOE/PC/92521–T70) **Integrated methods for production of clean char and its combustion properties: Interim final technical report, September 1, 1992–August 31, 1993.** DeBarr, J.A. (Illinois State Geological Survey, Champaign, IL (United States)); Rostam-Abadi, M.; Gullett, B.K.; Benson, S.A. Illinois Dept of Energy and Natural Resources, Springfield, IL (United States). [1993]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008012. Source: OSTI; NTIS; GPO Dep.

The feasibility of using an integrated method consisting of physical coal cleaning, mild gasification (MG) and low temperature oxidation (LTO) to produce chars with SO_2 emissions at least 50% lower than those of their parent coals was studied. MG and LTO studies were conducted in both a batch fluidized-bed reactor (FBR) and in continuous feed reactors. Combustion properties of coal-char blends were determined at the US EPA in a 14 kW pilot-scale combustor and ash deposition behaviors of selected fuels were determined at UNDEERC in a drop tube furnace (DTF) . This project was cost-shared with the US EPA and the US DOE through UNDEERC. MG chars were prepared from six different coals in the FBR. Under non-optimized conditions, desulfurized chars with SO_2 emissions 60–71% lower than the parent coals were made, depending on the coal. Chars prepared from four of the six coals had SO_2 emissions less than 2.5 lbs SO_2/MMBtu. Treatment of a high chlorine coal reduced its chlorine content over 93%. Optimization of process conditions revealed that the greatest reduction in SO_2 emissions was obtained using smaller particle diameters, steam during both MG and LTO, a higher temperature and higher oxygen partial pressure. For the only coal tested under optimized conditions, SO_2 emissions were reduced nearly 67%, from 4.60 to 1.49 lbs SO_2/MMBtu. Over 150 pounds of chars were prepared in the continuous feed reactors. A total of about 350 pounds of different coal-char blends were prepared for tests at the US EPA. These tests were completed July 31 and the results are currently being analyzed. Results of ash deposition tests at UNDEERC will be available for the final report.

11524 (DOE/PC/92521–T72) **Combustion and emissions characterization of pelletized coal fuels: Final technical report, September 1, 1992–August 31, 1993.** Rajan, S. (Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008014. Source: OSTI; NTIS; GPO Dep.

The feasibility of converting waste preparation plant coal streams into marketable fuels with good combustion and emissions properties has been investigated in this project. Coal pellets containing both hydrated lime and limestone as sorbents were made from a flotation column waste feedstock under a related Illinois Clean Coal Institute project. These pellets, which contain sorbent with Ca/S ratio varying from 0.8 to 2.4 were successfully burnt in a 4-inch internal diameter circulating fluidized bed combustor. Emissions levels of sulfur dioxide, oxides of nitrogen and hydrogen chloride were measured as a function of bed temperature. Mineral matter analyses of the combustion generated ash was made, and combustion efficiencies were studied. The pellet coals combustion performance was compared to that of an Illinois No. 6 run-of-mine coal from the same preparation plant. Results show that the coal pellets, produced from the flotation column waste stream, are excellent fluidized bed combustor fuels. Calcium hydroxide impregnated pellets yielded lower sulfur dioxide emissions than limestone sorbent pellets for the same Ca/S ratio. Increase in Ca/S ratio with the hydrated lime sorbent produced a more rapid decline in sulfur dioxide emissions than with the limestone sorbent. Oxides of nitrogen emissions were generally on the order of 0.3 to 0.4 lbs/10^6 Btu. Hydrogen chloride emissions were found to be influenced more by Ca/S ratios than by bed temperature, and varied in the range of 0.0075 to 0.055 lbs/10^6 Btu in the present tests. Combustion efficiencies of the pellet fuels were about 98% without secondary cyclones recycle. EDX analysis of the mineral matter in the raw coal and the combustion-generated ash samples sheds light on the mineral transformations during combustion.

11525 (DOE/PC/92521–T73) **Combustion properties of coal-char blends: NO_x emission characteristics: Interim final technical report, September 1, 1992–August 31, 1993.** Rostam-Abadi, M. (Illinois State Geological Survey, Champaign, IL (United States)); Khan, L.; Khan, S.; Smoot, L.D.; Germane, G.J.; Eatough, C.N. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94008015. Source: OSTI; NTIS; GPO Dep.

Under pulverized coal combustion conditions, NO_x formed during the release of volatile matter far exceed NO_x formed from combustion of the resulting char. It is believed that interactions of NO_x with char is responsible for the reduced NO_x formation from the combustion of char. The goal of this research is to assess the potential technical and economical benefits of co-firing coal-char blends in pulverized coal boilers to reduce NO_x. The rationale for the proposed research is that the presence of char in the flame during the initial stages of combustion may provide catalytic activity for reduction of NO_x produced from volatile nitrogen. This project is a cooperative effort between the Illinois State Geological Survey (ISGS) and BYU/ACERC. Seven hundred and fifty pounds of three coal-char blends containing 12.5%, 25%, and 50% char and 125 pounds of a coal-activated carbon blend containing 12.5% activated carbon were prepared. The volatile matter contents of the blends ranged from 27.3 to 35.6% (dry basis). Char (16.2 wt% volatile matter) was made from an Illinois No. 6 coal (Peabody Coal Company) in a continuous feed charring oven under mild gasification conditions. Nine combustion tests will be performed with the coal and blends in a 0.5–1.0 MBtu/hr combustor located at BYU. Combustion data will be analyzed to determine the effect of blend type, stoichiometry, and flame temperature on NO_x formation, ignition characteristics, flame stability, and combustion efficiency. A four month no-cost extension has been requested for the project. The results of the combustion tests will be reported in the final technical report in December 1993.

11526 (DOE/PC/92530–T5) **Bed material agglomeration during fluidized bed combustion: Technical progress report, 1 July, 1993–30 September, 1993.** Brown, R.C.; Dawson, M.R.; Noble, S.D. Iowa State Univ. of Science and Technology, Ames, IA (United States). Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92530. Order Number DE94007496. Source: OSTI; NTIS; GPO Dep.

Agglomerates formed in laboratory coal combustion tests were analyzed to determine the chemical and mineral reactions which

lead to the cohesion of bed particles. Combustion tests were conducted at 75, 90, 100, and 120% theoretical air values. The test at 75% theoretical air resulted in the formation of bed agglomerates within 30 minutes. Agglomerates which formed at the lower theoretical air values were compared to unagglomerated bed samples by X-ray diffraction analyses. Polished thin sections of the agglomerates were made for optical and scanning electron microscopy. The results of these analyses indicate there were, in a broad sense, two types of mineralogic reactions which lead to the cohesion of bed particles in the agglomerates. One mechanism of cohesion resulted from the melting of bed particles to form a viscous material which bridged other bed particles. Based on the chemical composition of the glass (which resulted from the melt), this material was probably derived from aluminosilicate minerals in the sand bed or from clays within the coal. Because of the high iron content in these glasses (4 to 5 wt%), it is likely that iron pyrites in the coal were involved in fluxing reactions. In addition, MgO appears to be relatively high in the glasses. It is suspected that Ca-Mg carbonates (dolomite) from the bed sand are also involved in mineralogic reactions with the aluminosilicate melt. The second type of mineralogic reaction appears to be a reaction involving calcium and magnesium with other bed particles and with the aluminosilicate melt to form new mineral phases. Although the composition of these phases is somewhat variable, some resemble single-chain silicates or pyroxenes.

11527 (TKK-KO/ET–51) **Particle convection on a heat transfer surface in a fluidized bed.** Helpioe, T. Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Energy Engineering. 1993. 68p. (In Finnish). Order Number DE94722028. Source: OSTI; NTIS.

The heat transfer in a fluidized bed can be divided into three components: the gas convective component, the particle convective component and the radiation. The particle convective component is important especially in beds consisting of relatively small particles. Many theories have been developed to describe the heat transfer between fluidized bed and heat transfer surface. These can roughly be divided into three groups: the film theories, the packet theories and the new models for large particles. In the models developed for great particles it is assumed that heat transfers between the particle and the heat transfer surface by convection through the thermal boundary layer. To be able to calculate the particle convective component, the thickness of this boundary layer must be known as well as the temperature distribution within the boundary layer. Further the average thickness of the air gap between the particle and the heat transfer surface must be known. Usually the value of this air gap is presumed to be in the range of $0{,}05d_p..0{,}15d_p$. Generally a rule of thumb, 10 % of particle diameter, is used. In this work an instrument for measuring the thickness of the air gap between particles and the heat transfer surface was developed. The fluidized bed was illuminated with a narrow laser beam entering the bed in 45 deg angle. The bed was observed with a line-scan camera. The shift of the laser spot on the cell of the line-scan camera corresponded the change of the distance between the particle and the heat transfer surface. The measurements were conducted using three different particle sizes (0,28, 0,89 and 2,83 mm) and three different fluidizing velocities. The average air gap thickness within the thermal boundary layer was determined for each measurement.

11528 (VTT-PUB–137) **On the measurement of volatile metal species at elevated temperatures.** Larjava, K. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Heating and Ventilation). Technical Research Centre of Finland, Espoo (Finland). 1993. 133p. Order Number DE94722000. Source: OSTI; NTIS.

Thermodynamic calculations were performed to find out the most relevant species in coal and waste combustion flue gases. According to thermodynamic calculations, vaporous cadmium, mercury, lead and zinc appear mainly in metallic form or as chlorides in flue gases when the atmosphere is oxidizing, and also as sulphides in the reducing atmosphere. The calculations were done using the measured data on coal and waste combustion processes. A vaporization/condensation method was developed to substitute inefficient and time-consuming conventional liquid absorption methods. As this developed method is rather complicated and in order to get information on different oxidation states of volatile metals, methods based on diffusion and the subsequent chemical reaction were developed: a denuder tube coated with silver and a diffusion screen coated with gold can be used as molecular collectors of cadmium and mercury. To investigate the performance of the developed volatile metal collectors in the laboratory, metal aerosol generators based on vaporization and diffusion, as well as an artificial laboratory stack, were developed and built. Mercury species were generated simply by vaporizing them in a temperature. Controlled diffusion cell and by leading the diff used species through heated tubes to a sampling device for testing. The effect of SO_2, H_20 and NO on the collection efficiency was also tested, but no significant reduction in the collection efficiency could be observed. In the first field experiments, diffusion methods were compared with a conventional high efficiency liquid absorption system ($HNO_3/K_2Cr_2O_7$).

0150 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11506

11529 (DOE/FE–0287) **The directory of United States coal & technology export resources: Profiles of domestic US corporations, associations and public entities, nationwide, which offer products or services suitable for export, relating to coal and its utilization.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Planning and Environment. Jan 1994. 396p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007231. Source: OSTI; NTIS; GPO Dep.

The purpose of this directory is to provide a listing of available U.S. coal and coal related resources to potential purchasers of those resources abroad. The directory lists business entities within the US which offer coal related resources, products and services for sale on the international market. Each listing is intended to describe the particular business niche or range of product and/or services offered by a particular company. The listing provides addresses, telephones, and telex/fax for key staff in each company committed to the facilitation of international trade. The content of each listing has been formulated especially for this directory and reflects data current as of the date of this edition. The directory listings are divided into four primary classifications: coal resources; technology resources; support services; and financing and resource packaging. The first three of which are subdivided as follows: Coal Resources – coal derivatives, coal exporters, and coal mining; Technology Resources – advanced utilization, architects and engineers, boiler equipment, emissions control and waste disposal systems, facility construction, mining equipment, power generation systems, technical publications, and transport equipment; Support Services – coal transport, facility operations, freight forwarders, sampling services and equipment, and technical consultants. Listings for the directory were solicited on the basis of this industry breakdown. Each of the four sections of this directory begins with a matrix illustrating which companies fall within the particular subclassifications specific to that main classification. A general alphabetical index of companies and an index by product/service classification are provided following the last section of the directory.

0160 Health and Safety

11530 (MSHA/IR–1212) **Material instability hazards in mineprocessing operations.** Fredland, J.W.; Wu, K.K.; Kirkwood, D.W. Mine Safety and Health Administration, Pittsburgh, PA (United States). Pittsburgh Health Technology Center. 1993. 10p. Sponsored by Department of Labor, Washington, DC (United States). Order Number DE94001241. Source: OSTI; NTIS.

Many accidents occur in the mining industry as a result of the instability of material during handling and processing operation. Accidents due to dump point instability at stockpiles, and at spoil or waste piles, for example, occur with alarming frequency. Miners must be trained to be better aware of these hazards. Information on safe working procedures at stockpiles and surge piles is provided. Mine operators must review their training and operating procedures regularly to ensure that hazardous conditions are avoided.

0170 Legislation and Regulations

11531 (DOE/METC–93/6131, pp. 3) **Government policy impact on coal and coal technology.** Goodman, C.H. (Southern Company Services, Inc., Birmingham, AL (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Coal is and will continue to be the cornerstone of the written or actual energy policies of both the US and many other countries. Although it is not always popular to make this statement we must recognize its truth and reflect this in the development and implementation of current and future policies. This presentation will discuss how we can accomplish this, using Clean Air Implementation and Global Climate Change concerns as examples.

02 PETROLEUM

0202 Reserves, Geology, and Exploration

Refer also to citation(s) 11503, 11538, 11539, 11541, 11542, 11548, 11549, 11550

11532 (DOE/BC/14474–11) **Characterization and modification of fluid conductivity in heterogeneous reservoirs to improve sweep efficiency: Second quarterly report, January 1–March 31, 1992.** Fogler, H.S. Michigan Univ., Ann Arbor, MI (United States). [1992]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89BC14474. Order Number DE94007804. Source: OSTI; NTIS; GPO Dep.

To optimize the petroleum recovery process from a formation, it is essential to accurately characterize potential reservoirs in terms of porosity, permeability, and hydrocarbon content. The quality of a given reservoir is determined by diagenetic processes that have been occurring over very long periods of time. The ability to mathematically model diagenetic processes and to predict a reservoir's characteristics provides a great tool to help evaluate formations. This report describes, the model currently used to perform these tasks. The existing network model was upgraded to more realistically simulate a porous media. Although many of the features from the previous model remain, two major modifications were made to improve upon the previous model: (1) the extension of the two-dimensional model into three-dimensions; and (2) the inclusion of pore bodies in the network model. The advantages that this model has over the previous model include: (1) a more accurate geometric representation (3-D vs. 2-D) of a reservoir; (2) pore bodies with fmite volumes where reactions can occur (as opposed to points of mixing); (3) a more distinguishable picture of various flow phenomena (wormholing, dominant flow paths, etc.); (4) the potential for observing back flow in the media; and (5) more realistic changes in porosity, i.e. pore body effects. The model was tested for the acidization of limestone with HCl. In this particular system, the important parameter studied was the effect of the Damkohler number (ratio of acid consumption rate to acid convection rate) on the propagation of acid through the porous limestone.

11533 (DOE/BC/14652–11) **Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: Annual report, July 12, 1991–September 12, 1992.** Menzie, D.E. Oklahoma Univ., Norman, OK (United States). Jan 1993. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14652. Order Number DE94007802. Source: OSTI; NTIS; GPO Dep.

This study developed a new method using dispersion measurements by which the flow characterization in a porous medium or reservoir can be determined. The fundamentals of the dispersion characteristic in consolidated porous media were investigated and employed to evaluate the reservoir characterization. A series of miscible displacement tests were conducted on Berea and Brown sandstones with different permeabilities, system lengths, and heterogeneity. The analytical methodologies, (1) X-ray computed tomograph (CT) method, (2) X-ray linear core scanning method, and (3) refractive index method, were utilized for dispersion measurements. The laboratory techniques developed in this study and the detailed experimental procedures are presented. The experimental results were analyzed by utilizing the concentration profiles obtained from experimental dispersion tests. The results have shown that the concentration profile appears to be a strong function of rock permeability and heterogeneity and that the dispersivity is a length dependent variable. The results show there exists a critical length in a dispersion measurement. A new parameter is defined and referred to as the dispersion factor. Both the laboratory dispersion factors and the field dispersion factors have been determined and discussed. The study concludes the dispersion factor can be used to evaluate the flow characterization of a miscible displacement, and that a dispersion factor measured in a field test is more representative of a given reservoir than dispersion factors measured in the laboratory. A large dispersion factor corresponds to miscible fluids flowing through a heterogeneous rock or reservoir, and a small dispersion factor corresponds to miscible fluids flowing through a homogeneous rock or reservoir.

11534 (DOE/BC/14966–2) **Fabrication and downhole testing of moving through casing resistivity apparatus: [Quarterly] report, July 1, 1993–September 30, 1993.** Vail, W.B. ParaMagnetic Logging, Inc., Woodinville, WA (United States). 30 Jun 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93BC14966. Order Number DE94007792. Source: OSTI; NTIS; GPO Dep.

This is a continuing research effort into the new field of measuring resistivity of geological formations from within cased wells. Additional data confirming the feasibility of the technology is to be taken in a test well with the existing stop-hold-and-lock apparatus which is called the Thru Casing Resistivity Apparatus (TCRA). After that data is obtained, the already existing mechanical apparatus developed in an earlier phase of the project will then be modified and new electronic components will be fabricated to test the concept of a moving apparatus called the Moving Thru Casing Resistivity Apparatus (Moving TCRA). These steps are considered sufficient for subsequent commercial development by industry. The study by ParaMagnetic Logging, Inc. of measuring resistivity through casing with the Thru Casing Resistivity Apparatus is of great importance to the oil and gas industries. It is important to measure resistivity through casing for at least the following reasons: locating bypassed oil and gas; measuring water breakthrough during water flooding operations; reservoir evaluation; measurements through a drill string when the drilling bit is stopped; and environmental monitoring of disposal wells, water wells, etc.

11535 (DOE/EIA–0575(94)) **Oil and gas resources of the Fergana basin (Uzbekistan, Tadzhikistan, and Kyrgyzstan): Advance summary.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 7 Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008249. Source: OSTI; NTIS; GPO Dep.

The Energy Information Administration (EIA), in cooperation with the US Geological Survey (USGS), has assessed 13 major petroleum producing regions outside of the United States. This series of assessments has been performed under EIA's Foreign Energy Supply Assessment Program (FESAP). The basic approach used in these assessments was to combine historical drilling, discovery, and production data with EIA reserve estimates and USGS undiscovered resource estimates. Field-level data for discovered oil were used for these previous assessments. In FESAP, supply projections through depletion were typically formulated for the country or major producing region. Until now, EIA has not prepared an assessment of oil and gas provinces in the former Soviet Union (FSU). Before breakup of the Soviet Union in 1991, the Fergana basin was selected for a trial assessment of its discovered and undiscovered oil and gas. The object was to see if enough data could be collected and estimated to perform reasonable field-level estimates of oil and gas in this basin. If so, then assessments of other basins in the FSU could be considered. The objective was met and assessments of other basins can be considered. Collected data for this assessment cover discoveries through 1987. Compared to most other oil and gas provinces in the FSU, the Fergana basin is relatively small in geographic size, and in number and size

of most of its oil and gas fields. However, with recent emphasis given to the central graben as a result of the relatively large Mingbulak field, the basin's oil and gas potential has significantly increased. At least 7 additional fields to the 53 fields analyzed are known and are assumed to have been discovered after 1987.

11536 (DOE/ID/10412–8) **Consolidation of geologic studies of geopressured-geothermal resources in Texas: Barrier-bar tidal-channel reservoir facies architecture, Jackson Group, Prado field, South Texas: Final report.** Seni, S.J.; Choh, S.J. Texas Univ., Austin, TX (United States). Bureau of Economic Geology. Jan 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-85ID10412. Order Number DE94005891. Source: OSTI; NTIS; GPO Dep.

Sandstone reservoirs in the Jackson barrier/strandplain play are characterized by low recovery efficiencies and thus contain a large hydrocarbon resource target potentially amenable to advanced recovery techniques. Prado field, Jim Hogg County, South Texas, has produced over 23 million bbl of oil and over 32 million mcf gas from combination structural-stratigraphic traps in the Eocene lower Jackson Group. Hydrocarbon entrapment at Prado field is a result of anticlinal nosing by differential compaction and updip pinch-out of barrier bar sandstone. Relative base-level lowering resulted in forced regression that established lower Jackson shoreline sandstones in a relatively distal location in central Jim Hogg County. Reservoir sand bodies at Prado field comprise complex assemblages of barrier-bar, tidal-inlet fill, back-barrier bar, and shoreface environments. Subsequent progradation built the barrier-bar system seaward 1 to 2 mi. Within the barrier-bar system, favorable targets for hydrocarbon reexploration are concentrated in tidal-inlet facies because they possess the greatest degree of depositional heterogeneity. The purpose of this report is (1) to describe and analyze the sand-body architecture, depositional facies variations, and structure of Prado field, (2) to determine controls on distribution of hydrocarbons pertinent to reexploration for bypassed hydrocarbons, (3) to describe reservoir models at Prado field, and (4) to develop new data affecting the suitability of Jackson oil fields as possible candidates for thermally enhanced recovery of medium to heavy oil.

11537 (Juel–2750) **Carbonate redistribution, element mobilisation and petroleum hydrocarbon migration in Posidonia shale (Hils basin, NW Germany) as a function of palaeotemperature load from the Vlotho mass.** Jochum, J. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 4: Erdoel und Organische Chemie; Technische Hochschule Aachen (Germany). Apr 1993. 236p. (In German). Order Number DE94747609. Source: OSTI; NTIS (US Sales Only).

Temperature-controlled processes of carbonate redistribution, element mobilisation and petroleum hydrocarbon migration in the Posidonia shale of North West Germany (Lower Toarcian) were documented, and a statistical evaluation was made. The investigations focused on six Posidonia shales of the Hils basin which had been exposed to increasing palaeotemperature stress from SE to NW in the direction of the injected mass of Vlotho. According to earlier investigations, the mean values of vitrinite reflection in the six boreholes are between 0.48% Rm and 1.45% Rm. This corresponds to a maximum palaeotemperature of 93-190 C. (orig./EF)

0203 Drilling and Production

Refer also to citation(s) 11575, 11582, 11591

11538 (DOE/BC–93/2) **Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 74, Quarter ending March 31, 1993.** USDOE Bartlesville Project Office, OK (United States). Mar 1994. 156p. Sponsored by USDOE, Washington, DC (United States). Order Number DE93000147. Source: OSTI; NTIS; GPO Dep.

Accomplishments for the past quarter are presented for the following tasks: chemical flooding–supporting research; gas displacement–supporting research; thermal recovery–supporting research; geoscience technology; resource assessment technology; microbial technology; field demonstrations in high-priority reservoir classes; and novel technology. A list of available publication is also provided.

11539 (DOE/BC/14652–13) **Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: [Quarterly] report, July 12, 1993–October 12, 1993.** Menzie, D.E. Oklahoma Univ., Norman, OK (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14652. Order Number DE94007801. Source: OSTI; NTIS; GPO Dep.

Dispersion of fluids flowing through porous media is an important phenomenon in miscible displacement. Much of the research involving dispersion and dispersivity as a property of reservoir rock has focused on miscible liquid-liquid displacement processes. This study addresses the measurement of dispersion in a gas-gas displacement system. The objectives of this study are: (1) to develop a method and set up an experimental apparatus to measure gas-gas dispersion in consolidated rocks.(2) to study the effect of displacement velocity and pressure on gas-gas dispersion and dispersivity; and (3) to study the heterogeneity of reservoir rocks and investigate the relationship between dispersivity and rock properties to characterize the flow system using gas-gas dispersion measurements. New experimental methods and apparatus for gas-gas dispersion were developed in this study. Twenty eight gas-gas miscible displacement measurements under different flowrates and pressures were conducted on three Berea sandstone cores of varying lengths and physical properties. A gas chromatograph was utilized and modified to measure the concentration of gas at the outlet of the cores. Nitrogen was used as the displacing gas, while helium was used as the displaced gas. The experimental results were illustrated using S-shaped effluent breakthrough curves. The effect of flowrate and pressure on gas-gas dispersion, dispersion coefficient, dispersivity, and dispersion factor were determined from these curves. Gas effective diffusion coefficients were obtained by graphical methods using the dispersion coefficients under low velocities. The heterogeneity of reservoir rock can be studied by this method.

11540 (DOE/BC/14652–14) **Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: Annual report, July 12, 1992–July 12, 1993.** Menzie, D.E. Oklahoma Univ., Norman, OK (United States). Jan 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14652. Order Number DE94008190. Source: OSTI; NTIS; GPO Dep.

Dispersion of fluids flowing through porous media is an important phenomenon in miscible displacement. Much of the research involving dispersion and dispersivity as a property of reservoir rock has focused on miscible liquid-liquid displacement processes. This study addresses the measurement of dispersion in a gas-gas displacement system. It will enlarge the understanding of the characteristics of dispersivity and flow systems of reservoir rocks. New experimental methods and apparatus for gas-gas dispersion were developed in this study. Twenty eight gas-gas miscible displacement measurements under different flowrates and pressures were conducted on three Berea sandstone cores of varying lengths and physical properties. A gas chromatograph was utilized and modified to measure the concentration of gas at the outlet of the cores. Nitrogen was used as the displacing gas, while helium was used as the displaced gas. The experimental results were illustrated using S-shaped effluent breakthrough curves. The effect of flowrate and pressure on gas-gas dispersion, dispersion coefficient, dispersivity, and dispersion factor were determined from these curves. Gas effective diffusion coefficients were obtained by graphical methods using the dispersion coefficients under low velocities. A new method to determine the total flowing pore volume by dispersion measurement was proposed in this study. The heterogeneity of reservoir rock can be studied by this method. An increase in displacing velocity was found to decrease the mixing or dispersion of gases in porous media under low pressure (15, 30 and 40 psig). The presumption was made that a critical velocity exists for a given displacement, below which the increase of velocity results in a decrease in dispersion, and above which an increase in dispersion occurs. An increase in pressure will decrease the mixing of gases when the displacement velocity remains constant.

11541 (DOE/BC/14831–5) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Summary annual report, February 18, 1992–February 18, 1993.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. 17 Mar 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE940C8187. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to assist the recovery of non-contacted oil from known reservoirs on the Outer Continental Shelf in the Gulf of Mexico. Thus far, research has consisted of data collection from Minerals Management Service (MMS); literature and operators; screening of reservoirs for detailed studies; modification of two public domain simulators; development of a predictive model; and design of several laboratory experiments for studying attic oil recovery. The methodology for data collection from MMS, literature and operators is keyed on 208 sands containing 1,289 reservoirs, representing 60% of the original oil in place (OOIP) in the Gulf of Mexico. This data collection is presently in progress after several delays concerning confidentiality agreements between MMS, DOE, and LSU and its subcontractors. Modifications on two public domain computer reservoir simulators, BOAST II and MASTER, is underway. Modifications will consist of developing a code to handle steeply dipping oil reservoirs and a radial grid format for near wellbore studies. Modifications for steeply dipping reservoirs have been successfully implemented. At present, modifications to BOAST II for radial grid systems are producing acceptable results in a reasonable, though long, period of time. Research of all phases listed above are in progress; therefore, no results or conclusions can be reported at this time.

11542 (DOE/BC/14831–6) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Final quarterly status report, July 1, 1993–September 30, 1993.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. 30 Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE94008188. Source: OSTI; NTIS; GPO Dep.

During this reporting period, data collection from the Minerals Management Service (MMS) was completed and continued from several operators. Data analysis continued on Reservoir 3 in Field 2. Evaluation included well log analysis, pressure and production data analysis, evaluation of PVT data and development of preliminary model grid schemes. Material balance and computer simulations studies of the B-65-G Sand reservoir, in South Marsh 73 Field, also continued. Work continues on refining the match for use in predictive runs. Four wells produced from the reservoir; three injected some quantity of gas and one well injected no gas. A fifth downdip well, served as a primary gas injector. The reservoir model was developed by integrating geologic and engineering data. The reservoir is a long, north-south trending, steeply dipping sandstone, which pinches out just before encountering a piercement salt dome. The reservoir produced 3,909.8 MSTB of oil, 3,760.2 MMCF (2,745 MMCF was re-injected) of gas and 545 MBbls of water over a period of 27 years. Originally, it was believed that the reservoir was subject to a fairly strong water drive. However, upon performing material balance studies it was found to have a very weak and limited water drive. This was later confirmed by the simulation work. A 2D adaptive finite element model capable of simulating oil/water flow in a porous media was constructed. These results have been submitted for publication and accepted for presentation in March, 1994. In addition, a manuscript describing the construction of a new finite element for use in 3D adaptive methods has been submitted for review.

11543 (DOE/BC/14860–3) **Detailed evaluation of the West Kiehl alkaline-surfactant-polymer field project and it's application to mature Minnelusa waterfloods: Technical progress report, July–September 1993.** Pitts, M.J.; Surkalo, H. Surtek, Inc., Golden, CO (United States). 7 Jan 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14860. Order Number DE94007799. Source: OSTI; NTIS; GPO Dep.

The objective of "Detailed Evaluation of the West Kiehl Alkaline-Surfactant-Polymer Field Project and It's Application to Mature Minnelusa Waterfloods" is to (1) quantify the incremental oil produced from the West Kiehl alkaline-surfactant-polymer project by classical engineering and numerical simulation techniques, (2) to quantify the effect of chemical slug volume injection on incremental oil in the two swept areas of the field, (3) to determine the economic ramifications of the application of the alkaline-surfactant-polymer technology, (4) to forecast the results of injecting an alkaline-surfactant-polymer solution to mature waterfloods and polymer floods, and (5) to provide the basis for independent operators to book additional oil reserves by using the alkaline-surfactant-polymer technology. This report documents the initial geological and reservoir engineering data gathering. In addition, some of the initial laboratory results are discussed. Some evaluation of the West Kiehl has been published.

11544 (DOE/BC/14881–4) **Improving reservoir conformance using gelled polymer systems: Fourth quarterly report, June 25, 1993–September 24, 1993.** Green, D.W.; Willhite, G.P.; Buller, C.; McCool, S.; Vossoughi, S.; Michnick, M. Kansas Univ. Center for Research, Inc., Lawrence, KS (United States). 15 Dec 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14881. Order Number DE94007800. Source: OSTI; NTIS; GPO Dep.

The general objectives are to (1) to identify and develop gelled polymer systems which have potential to improve reservoir conformance of fluid displacement processes, (2) to determine the performance of these systems in bulk and in porous media, and (3) to develop methods to predict the capability of these systems to recover oil from petroleum reservoirs. This work focuses on three types of gel systems – an aqueous polysaccharide (KUSP1) system that gels as a function of pH, the chromium(III)-polyacrylamide system and the aluminum citrate-polyacrylamide system. Laboratory research is directed at the fundamental understanding of the physics and chemistry of the gelation process in bulk form and in porous media. This knowledge will be used to develop conceptual and mathematical models of the gelation process. Mathematical models will then be extended to predict the performance of gelled polymer treatments in oil reservoirs. Accomplishments for this quarter are presented for the following tasks: development and selection of gelled polymer systems; physical and chemical characterization of gel systems; and mathematical modelling of gel systems.

11545 (DOE/BC/14884–3) **Surfactant loss control in chemical flooding: Spectroscopic and calorimetric study of adsorption and precipitation on reservoir minerals: Quarterly technical progress report, April 1, 1993–June 30, 1993.** Somasundaran, P. Columbia Univ., New York, NY (United States). 31 Aug 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14884. Order Number DE94007797. Source: OSTI; NTIS; GPO Dep.

The aim of this contract is to elucidate the mechanisms underlying adsorption and surface precipitation of flooding surfactants on reservoir minerals. The results of this study should help in controlling surfactant loss in chemical flooding and also in developing optimum structures and conditions for efficient chemical flooding processes. Adsorption of single surfactants on silica and alumina as well as the solution behavior of surfactant mixtures was studied during this quarter. The adsorption of surfactants at the solid-liquid interface was correlated with changes in interfacial behavior such as wettability and zeta potential. Surface tension was used to study interactions between surfactant mixtures in solution. Mixed micellization of sodium dodecyl sulfate and dodecyl phenoxy polyethoxylated alcohol was found to be non-ideal. Regular solution theory adequately describes the interactions. The adsorption isotherm of a cationic surfactant, tetradecyl trimethyl ammonium chloride (TTAC), on alumina was determined at two values of pH. Changes in the settling rate of alumina suspensions after TTAC adsorption were also followed to describe the evolution of the adsorbed layer. At high surface coverage it was observed that the alumina surface became hydrophilic suggesting the formation of a TTAC bilayer at the surface. Wettability of silica after adsorption of nonyl phenyl polyethoxylated alcohols (with number of polyethylene oxide groups varying from 10-40) was measured using flotation to

determine the orientation of the adsorbed layer. Effect of number of ethylene oxide groups was also determined. The amount of silica floated after the nonionic surfactant adsorption was same irrespective of the ethylene oxide chain length.

11546 (DOE/BC/14884–4) **Surfactant loss control in chemical flooding: Spectroscopic and calorimetric study of adsorption and precipitation on reservoir minerals: Quarterly technical progress report, July 1, 1993–September 30, 1993.** Somasundaran, P. Columbia Univ., New York, NY (United States). 30 Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14884. Order Number DE94007798. Source: OSTI; NTIS; GPO Dep.

The aim of this contract is to elucidate the mechanisms underlying adsorption and surface precipitation of flooding surfactants on reservoir minerals. Effect of surfactant structure, surfactant combinations and other inorganic and polymeric species will also be determined. Solids of relevant mineralogy and a multi-pronged approach consisting of micro & nano spectroscopy, microcalorimetry, electrokinetics, surface tension and wettability will be used to achieve the goals. The results of this study should help in controlling surfactant loss in chemical flooding and also in developing optimum structures and conditions for efficient chemical flooding processes. Adsorption/desorption of single surfactant and surfactant mixtures at the kaolinite-water and alumina-water interface were studied during this quarter. The adsorption of sodium dodecyl sulfate (SDS) and octaethylene glycol mono n-decyl ether ($C_{I2}EO_8$) on kaolinite was found to be higher from their mixtures than as single components. This enhanced adsorption was attributed to be due to hydrophobic chain-chain interactions. The effect of pH on the adsorption of single and surfactant mixtures on kaolinite was also elucidated. Desorption of cationic tetradecyl trimethyl ammonium chloride (TTAC) studied at the alumina-water interface indicated that adsorption was reversible. Electrokinetic measurements supported this observation.

11547 (DOE/BC/14899–9) **Visualization and simulation of bubble growth in pore networks.** Li, Xuehai; Yortsos, Y.C. University of Southern California, Los Angeles, CA (United States). Mar 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93BC14899. Order Number DE94000116. Source: OSTI; NTIS; GPO Dep.

Bubble nucleation and bubble growth in porous media is an important problem encountered in processes, such as pressure depletion and boiling. To understand its basic aspects, experiments and numerical simulations in micromodel geometries were undertaken. Experiments of bubble growth by pressure depletion were carried out in 2-D etched-glass micromodels and in Hele-Shaw cells. Nucleation of bubbles and the subsequent growth of gas clusters were visualized. Contrary to the bulk or to Hele-Shaw cells, gas clusters in the micromodel have irregular and ramified shapes and share many of the features of an external invasion process (e.g. of percolation during drainage). A pore network numerical model was developed to simulate the growth of multiple gas clusters under various conditions. The model is based on the solution of the convection-diffusions equation and also accounts for capillary and viscous forces, which play an important role in determining the growth patterns. Numerical simulation resulted in good agreement with the experimental results.

11548 (DOE/BC/14951–3) **Integrated approach towards the application of horizontal wells to improve waterflooding performance: [Quarterly report], July 1–September 30, 1993.** Kelkar, B.G. Tulsa Univ., OK (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14951. Order Number DE94007796. Source: OSTI; NTIS; GPO Dep.

The overall purpose of the proposed project is to improve secondary recovery performance of a marginal oil field through the use of a horizontal injection well. The location and direction of the well will be selected based on the detailed reservoir description using integrated approach. To accomplish the goals of the project, it is divided into two stages. In Stage 1, we will select part of the Glenn Pool field (William B. Self Unit), and collect additional reservoir data by conducting cross bore hole tomography surveys and formation microscanner logs through newly drilled well. In addition, we will also utilize analogous outcrop data. By combining the state of the art data with conventional core and log data, we will develop a detailed reservoir description based on integrated approach. After conducting extensive reservoir simulation studies, we will select a location and direction of a horizontal injection well. The well will be drilled based on optimized design, and the field performance will be monitored for at least six months. If the performance is encouraging, we will enter into second budget period of the project. If continued, the second budget period of the project will involve selection of part of the same reservoir (Berryhill Unit - Tract 7), development of reservoir description using only conventional data, simulation of flow performance using developed reservoir description, selection of a location and direction of a horizontal injection well, and implementation of the well followed by monitoring of reservoir performance. This report is divided into three sections. In the first section, we discuss the preliminary results based on the cross bore hole seismic surveys. In the second section, we discuss the geological description of the Self Unit. In the last section, we present petrophysical properties description of the reservoir followed by the flow simulation results.

11549 (DOE/BC/14955–2) **Applications of advanced petroleum production technology and water alternating gas injection for enhanced oil recovery: Mattoon Oil Field, Illinois: Quarterly report.** Baroni, M.R. American Oil Recovery, Inc., Decatur, IL (United States). 30 Sep 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14955. Order Number DE94007793. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to continue reservoir characterization of the Cypress Sandstone and identify and map a series of Facies Defined Waterflood Units (FDWS); and to design and implement water-alternating-gas WAG injection utilizing carbon dioxide. The producibility problems are permeability variation and poor sweep efficiency. Part 1 of the project focuses on the development of a computer generated geological model that will be used to select sites for the demonstration in Part 2. Included in Part 1 of the project is the drilling of an infill well, coring 100′ of the Cypress Sand, and various injectivity testing to gather information used to update the model. Part 2 involves field implementation of WAG. Technology Transfer includes outreach activity such as seminars, workshops, and field trips. Accomplishments for this quarter are presented.

11550 (DOE/BC/14955–3) **Applications of advanced petroleum production technology and water alternating gas injection for enhanced oil recovery: Mattoon Oil Field, Illinois: Third quarterly report, [July–September 1993].** Baroni, M.R. American Oil Recovery, Inc., Decatur, IL (United States). 21 Dec 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14955. Order Number DE94007794. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to continue reservoir characterization of the Cypress Sandstone; to identify and map facies-defined waterflood units (FDWS); and to design and implement water-alternating-gas (WAG) oil recovery utilizing carbon dioxide (CO_2) The producibility problems are permeability variation and poor sweep efficiency. Part 1 of the project focuses on the development of computer-generated geological and reservoir simulation models that will be used to select sites for the demonstration and implementation of CO_2 displacement programs in Part 2. Included in Part 1 is the site selection and drilling of an infill well, coring of the Cypress interval, and injectivity testing to gather information used to update the reservoir simulation model. Part 2 involves field implementation of WAG. Technology Transfer includes outreach activity such as seminars, workshops, and field trips.

11551 (DOE/ID/01570–T172) **Enhanced oil recovery and applied geoscience research program: [Quarterly] report, April 1–June 30, 1993.** Thomas, C.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007767. Source: OSTI; NTIS; GPO Dep.

The objectives of this research program are to develop microbial enhanced oil recovery (MEOR) systems for application to reservoirs containing medium to heavy oils and to evaluate reservoir wettability and its effects on oil recovery. The MEOR research goals

include: (a) development of bacterial cultures that are effective for oil displacement under a broad range of reservoir conditions, (b) improved understanding of the mechanisms by which microbial systems displace oil under reservoir conditions, (c) determination of the feasibility of combining microbial systems with or following conventional enhanced oil recovery (EOR) processes, (d) development and implementation of industry cost-shared field demonstration projects for MEOR technology. The goals of the reservoir wettability project are to develop: (a) better methods for assessment of reservoir core wettability, (b) more certainty in relating laboratory core analysis procedures to field conditions, (c) a better understanding of the effects of reservoir matrix properties and heterogeneity on wettability, and (d) improved ability to predict and influence waterflood and EOR response through control of wettability in reservoirs.

11552 (DOE/ID/01570–T173) **Enhanced oil recovery and applied geoscience research program: [Quarterly progress report], July 1–September 1993.** Thomas, C.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007948. Source: OSTI; NTIS; GPO Dep.

The objectives of this research program are to develop microbial enhanced oil recovery (MEOR) systems for application to reservoirs containing medium to heavy oils and to evaluate reservoir wettability and its effects on oil recovery. The MEOR research goals include: (a) development of bacterial cultures that are effective for oil displacement under a broad range of reservoir conditions, (b) improved understanding of the mechanisms by which microbial systems displace oil under reservoir conditions, (c) determination of the feasibility of combining microbial systems with or following conventional enhanced oil recovery (EOR) processes, (d) development and implementation of industry cost-shared field demonstration projects for MEOR technology. The goals of the reservoir wettability project are to develop: (a) better methods for assessment of reservoir core wettability, (b) more certainty in relating laboratory core analysis procedures to field conditions, (c) a better understanding of the effects of reservoir matrix properties and heterogeneity on wettability, and (d) improved ability to predict and influence waterflood and EOR response through control of wettability in reservoirs. Accomplishments for this quarter are presented for; MEOR research and field application; and reservoir wettability and its effect on oil recovery.

11553 (DOE/ID/10412–6) **Geothermal and heavy-oil resources in Texas.** Seni, S.J.; Walter, T.G. Texas Univ., Austin, TX (United States). Bureau of Economic Geology. Jan 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-85ID10412. Order Number DE94005889. Source: OSTI; NTIS; GPO Dep.

In a five-county area of South Texas, geopressured-geothermal reservoirs in the Paleocene-Eocene Wilcox Group lie below medium- to heavy-oil reservoirs in the Eocene Jackson Group. This fortuitous association suggests the use of geothermal fluids for thermally enhanced oil recovery (TEOR). Geothermal fairways are formed where thick deltaic sandstones are compartmentalized by growth faults. Wilcox geothermal reservoirs in South Texas are present at depths of 11,000 to 15,000 ft (3,350 to 4,570 m) in laterally continuous sandstones 100 to 200 ft (30 to 60 m) thick. Permeability is generally low (typically 1 md), porosity ranges from 12 to 24 percent, and temperature exceeds 250°F (121°C). Reservoirs containing medium (20° to 25° API gravity) to heavy (10° to 20° API gravity) oil are concentrated along the Texas Coastal Plain in the Jackson-Yegua Barrier/Strandplain (Mirando Trend), Cap Rock, and Piercement Salt Dome plays and in the East Texas Basin in Woodbine Fluvial/Deltaic Strandplain and Paluxy Fault Line plays. Injection of hot, moderately fresh to saline brines will improve oil recovery by lowering viscosity and decreasing residual oil saturation. Smectite clay matrix could swell and clog pore throats if injected waters have low salinity. The high temperature of injected fluids will collapse some of the interlayer clays, thus increasing porosity and permeability. Reservoir heterogeneity resulting from facies variation and diagenesis must be considered when siting production and injection wells within the heavy-oil reservoir. The ability of abandoned gas wells to produce sufficient volumes of hot water over the long term will also affect the economics of TEOR.

11554 (DOE/MC/27348–3631) **Phase and foam behavior study of CO_2-based foams at reservoir temperature and pressure: Final report, August 20, 1990–July 15, 1993.** Whiting, W.B.; Lim, K.H. West Virginia Univ., Morgantown, WV (United States). Oct 1993. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-90MC27348. Order Number DE94000100. Source: OSTI; NTIS; GPO Dep.

A major objective of the Enhanced Oil Recovery Program at Morgantown Energy Technology Center (METC) is to develop technologies based on CO_2, foams, emulsions, or other fluid dispersions that will alleviate viscous fingering and mobility control problems that severely limit the production of oil by miscible CO_2, flooding. In this project, data on the phase behavior of a model surfactant/water system were generated both to help in modeling work for phase behavior and dispersion morphologies and to provide an efficient experimental methodology for determination of these data from flow calorimetric measurements. The project consists of two separate but compatible subtasks, the results of which are described in detail in the two parts of the main body of this report.

11555 (DOE/MT/93007–T1) **Surfactant development for enhanced oil recovery: First quarterly report, [October 1993–January 1994].** Iwunze, M.O. Morgan State Univ., Baltimore, MD (United States). 25 Feb 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93MT93007. Order Number DE94007682. Source: OSTI; NTIS; GPO Dep.

This report covers the period from October, 1993 to January, 1994. It summarizes the activities on the grant to develop novel surfactants for enhanced oil recovery, and represents the first quarterly report for the project. During the period covered by this report, considerable effort was spent in arrangements for procuring equipment, chemicals and in educating students about the substance of the project. Unfortunately, the major equipment order to fully implement the project have not yet been delivered. A few surfactants, however have either been synthesized in the Morgan State laboratories or purchased from commercial manufacturers. South Carolina State continued to plan and set its laboratories during the period, and significant project administrative and management support was provided by the Institute for College Research Development and Support. As a starting point in the education, training and eventual proficiency in surfactant synthesis, the following cationic surfactants have been successfully synthesized: cetyltriethylammonium bromide, cetyltripropylammonium bromide and cetyltributylammonium bromide. NMR analysis of these surfactants was also carried out. In the absence of the major equipment, the critical micelle concentrations (CMCs) of the surfactants to be synthesized, were determined using the conductometric method. The CMC determination was necessary because there is a correlation between surface tension reduction and critical micelle concentration of surfactants. Results are listed.

11556 (NEI-NO–384) **Massively parallel algorithms in reservoir simulation.** Kaarstad, T. Bergen Univ. (Norway). Sep 1993. 117p. Order Number DE94743501. Source: OSTI; NTIS.

A two-phase, two-dimensional prototype of a massively parallel reservoir simulator based on domain decomposition has been developed. We have concentrated on methods with overlapping subdomains, also called Schwarz methods. The reservoir or domain is divided into small subdomains, and all subdomain problems can be solved in parallel. The methods have been validated on reservoir problems, and these tests show that reservoir simulation problems are well suited for parallel computing. 96 refs., 18 figs., 4 tabs.

11557 (NEI-NO–389) **Relative permeability and capillary pressure from centrifuge experiments.** Munkvold, F.R. Trondheim Univ. (Norway). Norges Tekniske Hoegskole. Oct 1993. 287p. Order Number DE94743508. Source: OSTI; NTIS.

The relative permeability to oil and the residual oil saturation are perhaps the most important parameters in gas drainage processes. Unsteady state displacement experiments are often performed with high injection rates to minimize capillary end effects. Viscous fingering probably make the end point saturation erroneous, and the

assumption of a stable displacement front in calculations will not be valid. As an alternative procedure for obtaining oil drainage relative permeabilities, the single speed centrifuge method was introduced. In the single speed method the centrifuge is set to accelerate to a constant rotational speed high enough to overwhelm capillary pressure, and the transient data are collected and used for interpretation of relative permeability to the displaced phase. The measurements are however difficult to do without an automated centrifuge, and good measurements of fluid production are of vital importance in this method. Few attempts have been made to relate the centrifuge method to other methods obtaining relative permeabilities. The present work has been oriented mostly towards automating the centrifuge and improving the data collecting procedure. Furthermore, existing methods for generating relative permeability from centrifuge have been used to verify these methods compared to standard measurement procedures. 79 refs., 125 figs., 9 tabs.

11558 (SAND–94-0390C) **Practical hot oiling and hot watering for paraffin control.** Mansure, A.J. (Sandia National Labs., Albuquerque, NM (United States)); Barker, K.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9404111–1: Society of Petroleum Engineers (SPE) production operations symposium; Society of Petroleum Engineers (SPE) production operations symposium, Lubbock, TX (United States); Oklahoma City, OK (United States), 20-21 Apr 1994; 21-23 mar 1993; Order Number DE94007302. Source: OSTI; NTIS; GPO Dep.

One of the common oil-field wellbore problems is paraffin deposition. Even though hot oiling or hot watering is usually the first method tried for removing paraffin, few operators appreciate the limitations of "hot oiling" and the potential for the fluid to aggravate well problems and cause formation damage. Field tests have shown that the chemical and thermal processes that occur during "hot oiling" are very complex and that there are significant variations in practices among operators. Key issues include: (1) During a typical hot oiling job, a significant amount of the fluid injected into the well goes into the formation, and hence, particulates and chemicals in the fluid have the potential to damage the formation. (2) Hot oiling can vaporize oil in the tubing faster than the pump lifts oil. This interrupts paraffin removal from the well, and thus the wax is refined into harder deposits, goes deeper into the well, and can stick rods. These insights have been used to determine good "hot oiling" practices designed to maximize wax removal and minimize formation damage.

0204 Processing

Refer also to citation(s) 11448, 11573

11559 (ANL/ESD–19) **Energy and crude oil input requirements for the production of reformulated gasolines.** Singh, M.; McNutt, B. Argonne National Lab., IL (United States). Oct 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008621. Source: OSTI; NTIS; GPO Dep.

The energy and crude oil requirements for the production of reformulated gasoline (RFG) are estimated. The scope of the study includes both the energy and crude oil embodied in the final product and the process energy required to manufacture the RFG and its components. The effects on energy and crude oil use of employing various oxygenates to meet the minimum oxygen-content level required by the Clean Air Act Amendments are evaluated. The analysis shows that production of RFG requires more total energy, but uses less crude oil, than that of conventional gasoline. The energy and crude oil use requirements of the different RFGs vary considerably. For the same emissions performance level, RFG with ethanol requires substantially more total energy and crude oil than does RFG with methyl tertiary butyl ether (MTBE) or ethyl tertiary butyl ether. A specific proposal by the US Environmental Protection Agency, designed to allow the use of ethanol in RFG, would increase the total energy required to produce RFG by 2% and the total crude oil required by 2.0 to 2.5% over the corresponding values for the base RFG with MTBE.

11560 (NEI-NO–385) **Coalescence in dense water/oil dispersions.** Thunem, H. Trondheim Univ. (Norway). Norges Tekniske Hoegskole. Jun 1993. 310p. Order Number DE94743504. Source: OSTI; NTIS.

This project has been divided into three parts. The first part has been to review a large amount of literature to obtain models describing separate stages of the coalescence of a single drop at an interface. These stages include the drop deformation, the film thinning, the critical film thickness, and the drop breakup. The second part has been to evaluate the different models and select which to use in the development of the OneDrop program. The models describing drop deformation and film thinning were supplied by Charles and Mason, however the film thinning model has been slightly enhanced in this project. The models and the enhancements made have been compared to experimental data from the literature and from work done by undergraduate students at our department. The third part of the project has been to implement the models to drop-drop coalescence, and to write the SIM program to simulate the coalescence in a system of many drops. We use the same equations as in the OneDrop case, except for the film thinning. But by using a similar derivation as for the OneDrop case, an equation for the SIM case has been developed. We have made the assumption that the physical phenomena regarding drop deformation, film thinning and critical film thickness are the same in the OneDrop and SIM cases, so the experimental validation of OneDrop also apply to SIM. By using the results from the SIM program, we can obtain some information about how different physical parameters will affect the collision frequency and collision efficiency. We may use this information to derive empirical equations describing these parameters effect on the coalescence probability in a dispersion. 207 refs., 83 figs., 21 tabs.

11561 (NIPER–658) **Relating feedstock composition to product slate and composition in catalytic cracking: 1. Bench scale experiments with liquid chromatographic fractions from Wilmington, CA, >650°F resid.** Green, J.B.; Zagula, E.J.; Reynolds, J.W.; Wandke, H.H.; Young, L.L.; Chew, H. National Inst. for Petroleum and Energy Research, Bartlesville, OK (United States). Sep 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-83FE60149. Order Number DE94008171. Source: OSTI; NTIS; GPO Dep.

The catalytic cracking behavior of compound types in the >650°F resid from a Wilmington, CA, 14.2° API crude was investigated. Liquid Chromatography (LC) was used to separate the resid into eight fractions. These fractions were used as feedstocks for a bench scale fluidized catalytic cracking (FCC) unit. Gasoline was produced almost exclusively from neutral (65 % of whole resid) components. Acidic and basic types were partially converted to coke plus small amounts of C_1 and C_2 gases, with the balance primarily carrying over as heavy liquid products. Gasoline composition depended on the type and quantity of polar compounds present in the feed because both acidic and basic compounds inhibited cracking reactions (β-scission, hydrogen transfer, etc.) to varying degrees. In accordance with prior work, basic nitrogen compounds exhibited the largest inhibitory effect on cracking. Their effect is dependent on concentrations up to a limiting value which may correspond to saturation of susceptible catalyst sites. On an equal weight basis, the effect of high boiling (high molecular weight) bases was less than those occurring in the 650–1000°F distillate range. Partitioning of nitrogen present in acidic (e.g. carbazole) forms in the feed into liquid products was greater than for basic nitrogen. Thiophenic forms of sulfur partitioned more into liquid and less into gaseous (H_2S) products than sulfide-type sulfur. Coke yield was approximately proportional to microcarbon residue test results for all feeds. Ongoing work with additional feedstocks has indicated behavior similar to that of Wilmington. Selected Wilmington liquid products are undergoing detailed analysis in order to determine relationships between feed versus product composition, particularly with respect to acidic and basic types.

11562 (ORNL–6751) **Rocky Mountain area petroleum product availability with reduced PADD IV refining capacity.** Hadder, G.R.; Chin, S.M. Oak Ridge National Lab., TN (United States). Feb 1994. 77p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC05-84OR21400. Order Number DE94007131. Source: OSTI; NTIS; GPO Dep.

Studies of Rocky Mountain area petroleum product availability with reduced refining capacity in Petroleum Administration for Defense IV (PADD IV, part of the Rocky Mountain area) have been performed with the Oak Ridge National Laboratory Refinery Yield Model, a linear program which has been updated to blend gasolines to satisfy constraints on emissions of nitrogen oxides and winter toxic air pollutants. The studies do not predict refinery closures in PADD IV. Rather, the reduced refining capacities provide an analytical framework for probing the flexibility of petroleum refining and distribution for winter demand conditions in the year 2000. Industry analysts have estimated that, for worst case scenarios, 20 to 35 percent of PADD IV refining capacity could be shut-down as a result of clean air and energy tax legislation. Given these industry projections, the study scenarios provide the following conclusions: The Rocky Mountain area petroleum system would have the capability to satisfy winter product demand with PADD IV refinery capacity shut-downs in the middle of the range of industry projections, but not in the high end of the range of projections. PADD IV crude oil production can be maintained by re-routing crude released from PADD IV refinery demands to satisfy increased crude oil demands in PADDs II (Midwest), III (Gulf Coast), and Washington. Clean Air Act product quality regulations generally do not increase the difficulty of satisfying emissions reduction constraints in the scenarios.

0205 Products and By-Products

Refer also to citation(s) 11430, 11439, 11561

0206 Health and Safety

Refer also to citation(s) 12686, 13317

11563 (CMR–92-A25047) **A review of gas explosions - causes and resulting loads.** Bakke, J.R. (Christian Michelsen Research A/S, Bergen (Norway)); Wingerden, K. van; Bjerketvedt, D. Christian Michelsen Research A/S, Bergen (Norway). Sep 1992. 13p. (CONF-9209435–1: Structural design against accidental loads as part of the offshore safety case, ERA technology, London (United Kingdom), 23-24 Sep 1992). Order Number DE94743514. Source: OSTI; NTIS.

The paper gives a description of current understanding of gas explosions, their causes and resulting loads. The effects on overpressure of fuel type and concentration, scale, explosion venting/confinement and blockage caused by equipment are addressed. A description of the use of the computer program FLACS (Flame Accelerations Simulator) to predict gas explosion loads is given. Simple rules-of-thumb to improve gas explosion safety are presented. 11 refs., 11 figs., 2 tabs.

0207 Economic, Industrial, and Business Aspects

11564 (CMR–92-A30008) **Operating costs on Norwegian fields.** Sunnevaag, K.; Nansve, A.H. Christian Michelsen Research A/S, Bergen (Norway). Sep 1992. 23p. Order Number DE94740217. Source: OSTI; NTIS; INIS.

In this report we summarize some of the findings in a project for A/S Norske Shell, where the objective was to find trends in the development of operating expenditures on the Norwegian Continental Shelf if any, and to explain these. We also present a short compilation of articles on the subject. 23 refs., 13 figs.

11565 (DOE/EIA–0109(94/02)) **Petroleum supply monthly, February 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 1 Mar 1994. 162p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007963. Source: OSTI; NTIS; GPO; GPO Dep.

The Petroleum Supply Monthly presents data describing the supply and disposition of petroleum products in the United States and major US geographic regions. The data series describe production, imports and exports, inter-Petroleum Administration for Defense (PAD) District movements, and inventories by the primary suppliers of petroleum products in the US. The reporting universe includes those petroleum sectors in primary supply. Included are: petroleum refiners, motor gasoline blenders; operators of natural gas processing plants and fractionators, inter-PAD transporters, importers, and major inventory holders of petroleum products and crude oil. Data are divided into two sections: Summary statistics and Detailed statistics.

11566 (DOE/EIA–0380(94/02)) **Petroleum marketing monthly, February 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 25 Feb 1994. 183p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007714. Source: OSTI; NTIS; GPO; GPO Dep.

The Petroleum Marketing Monthly is designed to give information and statistical data about a variety of crude oils and refined petroleum products. The publication provides statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiner's acquisition cost of crude oil. Sales data for motor gasoline, distillates, residuals, aviation fuels, kerosene, and propane are presented.

11567 (DOE/EIA–0520(94/02)) **International petroleum statistics report, February 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. 28 Feb 1994. 63p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007378. Source: OSTI; NTIS; GPO Dep.

The International Petroleum Statistics Report presents data on international oil production, demand, imports, exports, and stocks. The report has four sections. Section 1 contains time series data on world oil production, and on oil demand and stocks in the Organization for Economic Cooperation and Development (OECD). This section contains annual data beginning in 1985, and monthly data for the most recent two years. Section 2 presents an oil supply/demand balance for world. This balance is presented in quarterly intervals for the most recent two years. Section 3 presents data on oil imports by OECD countries. This section contains annual data for the most recent year, quarterly data for the most recent two quarters, and monthly data for the most recent twelve months. Section 4 presents annual time series data on world oil production and oil stocks, demand, and trade in OECD countries. World oil production and OECD demand data are for the years 1970 through 1992; OECD stocks from 1973 through 1992; and OECD trade from 1982 through 1992.

11568 (DOE/EIA–0538(93/94-19)) **Winter fuels report week ending, February 11, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 17 Feb 1994. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007057. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

11569 (DOE/EIA–0538(93/94-20)) **Winter fuels report week ending, February 18, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 24 Feb 1994. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007411. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

11570 (DOE/EIA–0538(93/94-21)) **Winter fuels report, week ending February 25, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 3 Mar 1994. 77p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007596. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and 111; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating, in the joint Energy Information Administration (EIA)/State Heating, Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

11571 (DOE/EIA–0538(93/94-22)) **Winter fuels report, week ending March 4, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 10 Mar 1994. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008215. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

11572 (DOE/EIA–0538(93/94-23)) **Winter fuels report, week ending March 11, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 17 Mar 1994. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008283. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: Distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices. Residential and wholesale pricing, data for heating oil and propane for those States participating, in the joint Energy Information Administration (EIA)/State Heating, Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

11573 (ORNL–6747) **Reformulated gasoline: Costs and refinery impacts.** Hadder, G.R. Oak Ridge National Lab., TN (United States). Feb 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008242. Source: OSTI; NTIS; INIS; GPO Dep.

Studies of reformulated gasoline (RFG) costs and refinery impacts have been performed with the Oak Ridge National Laboratory Refinery Yield Model (ORNL-RYM), a linear program which has been updated to blend gasolines to satisfy emissions constraints defined by preliminary complex emissions models. Policy makers may use the reformulation cost knee (the point at which costs start to rise sharply for incremental emissions control) to set emissions reduction targets, giving due consideration to the differences between model representations and actual refining operations. ORNL-RYM estimates that the reformulation cost knee for the US East Coast (PADD I) is about 15.2 cents per gallon with a 30 percent reduction of volatile organic compounds (VOCs). The estimated cost knee for the US Gulf Coast (PADD III) is about 5.5 cents per gallon with a VOC reduction of 35 percent. Reid vapor pressure (RVP) reduction is the dominant VOC reduction mechanism. Even with anti-dumping constraints, conventional gasoline appears to be an important sink which permits RFG to be blended with lower aromatics and sulfur contents in PADD III. In addition to the potentially large sensitivity of RFG production to different emissions models, RFG production is sensitive to the non-exhaust VOC share assumption for a particular VOC model. ORNL-RYM has also been used to estimate the sensitivity of RFG production to the cost of capital; to the RVP requirements for conventional gasoline; and to the percentage of RFG produced in a refining region.

0208 Waste Management

11574 (ANL/EA/CP–81981) **Regulating toxicity in drilling mud: An innovative approach using pollution prevention.** Burke, C.J. Argonne National Lab., Washington, DC (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940374–1: Environmental issues and solutions in exploration, production, and refining, Houston, TX (United States), 2-4 Mar 1994). Order Number DE94006822. Source: OSTI; NTIS; GPO Dep.

Both in terms of volume and toxic pollutants, drilling muds and drill cuttings are the most significant waste streams from exploratory and development activities in the oil and gas industry. Under the Clean Water Act, the US Environmental Protection Agency (EPA) regulates discharges of all contaminants, including drilling muds, into the waterways and offshore areas of the United States. EPA employs technology-based effluent standards in issuing discharge permits to both onshore and offshore operators. This paper examines the regulatory approaches used by EPA to limit toxicity in drilling muds at offshore drilling platforms and discusses other measures EPA has adopted to reduce toxicity of drilling muds discharged offshore. This effort focuses on an innovative approach that emphasizes pollution prevention used by EPA Region X for offshore Alaska, which is contrasted with a more traditional command and control regulatory approach used by other EPA regional offices. The Region X approach includes collection of influent and effluent data, development of a comprehensive data base of technical information, and prescription of specific mud formulas. This influent-effluent approach reduces uncertainty and guesswork, enhances use of innovative technology, and lowers toxic discharges compared to the standard EPA command and control approach. The influent-effluent approach provides a model for future efforts to incorporate pollution prevention into regulatory development and implementation. While this investigation found no evidence that toxicity limitations promulgated by EPA were having a deleterious impact on offshore developments, it identified major improvements in technology application, process management, and selection of raw materials which reduce toxicity of spent muds.

11575 (DOE/MT/92011–6) **Hydrogeochemical and production controls on NORM in oil- and gas- field operations: Technical progress report, January 1, 1993–March 31, 1993.** Fisher, R.S. Texas Univ., Austin, TX (United States). Bureau of Economic Geology. 30 Apr 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92011. Order Number DE94007806. Source: OSTI; NTIS; GPO Dep.

This project is designed to investigate the nature of geochemical, geological, and production parameters that control the occurrence of naturally occurring radioactive materials (NORM) in oil-and gas-field operations. Relations between reservoir setting and NORM content of brine and scale will be interpreted on the basis of formation brines and production-equipment scales collected at field sites for detailed chemical and mineralogical analyses. During the first quarter of 1993, we concentrated on gathering all available information concerning the distribution of NORM in Texas oil and gas fields, the geochemical behavior of uranium, thorium, and radium in formation water, the physical and chemical conditions that cause radium to be released from geologic formations to produced water, the geochemical conditions that cause scale to form, and the chemical factors that determine the NORM content of scale. Now that we have compiled all available published reports of production-water chemistry that include radium measurements and scale composition, we are ready to collect new scale and water samples and perform analyses. With assistance from the Railroad Commission of Texas we are beginning to identify specific oil and gas fields for sampling. These activities will be the focus of our efforts during the second quarter of 1993.

0209 Environmental Aspects

Refer also to citation(s) 11793

11576 (DOE/MT/92001–1) **Environmental and economic assessment of discharges from Gulf of Mexico Region oil and gas operations: Quarterly technical progress report, 23 June 1992–30 September 1992.** Gettleson, D.A. Continental Shelf Associates, Inc., Jupiter, FL (United States). 10 Nov 1992. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92001. Order Number DE94007807. Source: OSTI; NTIS; GPO Dep.

A Sampling and Analysis Plan was prepared and submitted to a Scientific Review Committee for comment. Substantial comments relative to study objectives, sampling design, and sampling periods coupled with the passage of Hurricane Andrew precluded the scheduled initiation of sampling at offshore and coastal sites (Tasks 3 – Environmental Field Sampling and Analysis of Naturally Occurring Radioactive Materials (NORM), Heavy Metals, and Organics and 4 – Monitoring of the Recovery of Impacted Wetland and Open Bay Produced Water Discharge Sites in Coastal Louisiana and Texas). A proposed revised schedule has been prepared for Tasks 3 and 4. Task 5 (Assessment of Economic Impacts of Offshore and Coastal Discharge Requirements on Present and Future Operations in the Gulf of Mexico Region), activities have involved identification and collection of the necessary data for the economic analysis. Task 6 (Synthesis of Gulf of Mexico Region Consumption and Use Patterns), activities have included near completion of the literature review and a reevaluation of the data collection efforts relative to the wholesaler, process plant, and restaurant components. Task 7 (Technology Transfer Plan), work has been delayed due to the Tasks 3 and 4 delay and cancellation of the annual US Minerals Management Service Gulf of Mexico Region Information Transfer Meeting.

0210 Legislation and Regulations

Refer also to citation(s) 11580, 11581

11577 (DOE–94007260) **The domestic natural gas and oil initiative: Energy leadership in the world economy.** USDOE, Washington, DC (United States). Dec 1993. 37p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007260. Source: OSTI; NTIS; GPO Dep.

Two key overarching goals of this Initiative are enhancing the efficiency and competitiveness of U.S. industry and reducing the trends toward higher imports. These goals take into account new Federal policies that reflect economic needs, including economic growth, deficit reduction, job creation and security, and global competitiveness, as well as the need to preserve the environment, improve energy efficiency, and provide for national security. The success of this Initiative clearly requires coordinated strategies that range far beyond policies primarily directed at natural gas and oil supplies. Therefore, this Initiative proposes three major strategic activities: Strategic Activity 1 – increase domestic natural gas and oil production and environmental protection by advancing and disseminating new exploration, production, and refining technologies; Strategic Activity 2 – stimulate markets for natural gas and natural-gas-derived products, including their use as substitutes for imported oil where feasible; and Strategic Activity 3 – ensure cost-effective environmental protection by streamlining and improving government communication, decision making, and regulation. Finally, the Initiative will reexamine the costs and benefits of increase oil imports through a broad new Department of Energy study. This study will form the basis for additional actions found to be warranted under the study.

11578 (DOE/EH–231-012E/0593) **Hazardous substance USTs: RCRA Subtitle 1, Underground Storage Tanks: RCRA Information Brief.** DiCerbo, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. May 1993. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008192. Source: OSTI; NTIS; GPO Dep.

Underground tanks that contain petroleum or hazardous substances may be subject to the Federal Underground Storage Tank (UST) regulations. These regulations, issued by the Environmental Protection Agency (EPA) under authority of Subtitle I of the Resource Conservation and Recovery Act (RCRA) [Section 9003 of the Hazardous an Solid Waste Amendments of 1984 (HSWA)], established standards for installation, operation, release detection corrective action, repair, and closure. The Department of Energy (DOE) is required by Section 9007 of RCRA t Implement these regulations at DOE facilities with USTs. DOE prepared a guidance document, Regulated Underground Storage Tanks (DOE/EH-231/004/0191, June 1992) that describes the UST procedural requirements which regulate tanks and piping for both petroleum and hazardous substance USTs as well as USTs containing radioactive material regulated under the Atomic Energy Act of 195 (42 U.S.C. 2011). This Information Brief supplements the UST guidance by responding to critical questions concerning how the regulations apply to hazardous substance USTs. It is a part of a series of Information Briefs which address issues pertinent to specific categories of USTs.

0220 Transport, Handling, and Storage

Refer also to citation(s) 11578

11579 (CMR–92-A15013) **A flow-regime independent multiphase flowrate meter.** Dykesteen, E.; Midttveit, Oe. Christian Michelsen Research A/S, Bergen (Norway). Oct 1993. 15p. Order Number DE94743503. Source: OSTI; NTIS.

A new multiphase flowrate meter, developed by Christian Michelsen Research, is of a non-intrusive design, and mounted in a vertical upwards flow, it will accept a wide range of flowrates and compositions without any preconditioning of the flow. The distribution of velocities present in the flow are measured by correlation techniques, and thus interphasial slip is directly measured and compensated for. The paper discusses why installation of mixers for preconditioning of the multiphase flow should be avoided, and it presents test results from extensive laboratory testing of the multiphase flowrate meter. The first field test installation is already in progress. 2 refs., 9 figs.

11580 (DOE/EH–012b/0593) **Excluded USTs: RCRA Subtitle 1, Underground Storage Tanks.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. May 1993. 5p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008194. Source: OSTI; NTIS; GPO Dep.

Underground tanks that contain either petroleum or hazardous substances are subject to the Federal Underground Storage Tank (UST) regulations. These regulations, issued by the Environmental Protection Agency (EPA) under authority of Subtitle I of the Resource Conservations and Recovery Act (RCRA) [Section 9003 of the Hazardous and Solid Waste Amendments of 1984 (HSWA)], establish standards for installation, operation, release detection, corrective action, repair, and closure. The Department of Energy (DOE) is required by Section 9007 of RCRA to implement these regulations at DOE facilities with USTs. Certain USTs have been excluded from the Federal UST regulations. These excluded USTs have been determined by either Congress or EPA to pose an insignificant risk to human health and the environment. By excluding these USTs from regulation, EPA is focusing resources on the USTs that pose substantially greater risk to human health and the environment. DOE prepared a guidance document, Regulated Underground Storage Tanks (DOE/EH-231/004/0191, June 1992), that describes the UST procedural requirements which regulate tanks and piping for both petroleum and hazardous substance USTs as well as USTs containing radioactive material regulated under the Atomic Energy Act of 1954 (42 U.S.C. 2011). This Information Brief supplements the UST guidance by responding to critical questions concerning how the regulations apply to excluded USTs. It is part of a series of information Briefs which address issues pertinent to specific categories of USTs.

11581 (DOE/EH–231-012D/0194) **Petroleum USTs: RCRA Subtitle 1, Underground Storage Tanks: RCRA Information Brief.** Dailey, R. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008214. Source: OSTI; NTIS; GPO Dep.

Underground tanks that contain petroleum or hazardous substances may be subject to the Federal Underground Storage Tank (UST) regulations. These regulations, issued by EPA under authority of Subtitle I of the Resource Conservation and Recovery (RCRA) [Section 9003 of the Hazardous and Solid Waste Amendments Act of 1984 (HSWA)], establish standards for installation, operation, release detection, corrective action, repair, and closure. The Department of Energy (DOE) is required by Section 9007 of RCRA to implement these regulations at DOE facilities with USTs. DOE prepared a guidance document, Regulated Underground Storage Tanks (DOE/EH-231/0041/0191, June 1992), that describes the UST procedural requirements which regulate tanks and piping for both petroleum and hazardous substance USTs as well as USTs containing radioactive material regulated under the Atomic Energy Act of 1954 (42 USC 2011). This information Brief supplements the UST guidance by responding to critical questions concerning how the regulations apply to petroleum USTs. It is part of a series of information Briefs which address issues pertinent to specific categories of USTs.

11582 (DOE/MT/92012–5) **Evaluation of using cyclocranes to support drilling and production of oil and gas in wetland areas: Fifth quarterly technical progress report, Third quarter, 1993.** Eggington, W.J. Mission Research Corp., San Diego, CA (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92012. Order Number DE94007805. Source: OSTI; NTIS; GPO Dep.

The planned program falls under wetlands area research related to drilling, production, and transportation of oil and gas resources. Specifically the planned program addresses an evaluation of using cyclocraft to transport drill rigs, mud, pipes and other materials and equipment in a cost effective and environmentally safe manner to support oil and gas drilling and production operations in wetland areas. The cyclocraft is a proven hybrid aircraft that utilizes aerostatic and aerodynamic lift. This type of aircraft has considerable payload capacity, VTOL capability, high controllability, low operating cost, low downwash and high safety. The benefits of using a cyclocraft to transport drill rigs and materials over environmentally-sensitive surfaces would be significant. The cyclocraft has considerable cost and operational advantages over the helicopter. In 1992, Task 1, Environmental Considerations, and Task 2, Transport Requirements, were completed. In the first two quarters of 1993, Task 3, Parametric Analysis, Task 4, Preliminary Design, and Task 6, Ground Support, were completed. Individual reports containing results obtained from each of these tasks were submitted to DOE. In addition, through June 30, 1993, a Subscale Test Plan was prepared under Task 5, Subscale Tests, and work was initiated on Task 7, Environmental Impacts, Task 8, Development Plan, Task 9, Operating Costs, and Task 10, Technology Transfer.

11583 (SAND–92-2891) **Long-term sealing analyses for US Strategic Petroleum Reserve (SPR) caverns.** Ehgartner, B. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007841. Source: OSTI; NTIS; GPO Dep.

It is inevitable that sealing and abandonment will someday occur in a SPR cavern or caverns. To gain insight into the long-term behavior of a typical SPR cavern following sealing and abandonment, a suite of mechanical finite-element calculations was performed. The initial analyses predict how quickly and to what extent a cavern pressurizes after it is plugged. The analyses also examine the stability of the cavern as it changes shape due to the excessive pressures generated as the salt creeps and the brine in the cavern thermally expands. These large-scale analyses do not include the details of the plug but assume a good seal is established in the cavern wells. In another series of analyses, the potential for forming a leak at the plug is evaluated. A cement plug, emplaced in the casing seat of a cavern well, is loaded using the predicted brine pressures from the cavern analyses. The plugged casing analyses examine the potential for forming a leak path in and along the interfaces of salt, casing, and cement plug. In the last set of analysis, the dimensional scale of the problem is further reduced to examine a preexisting crack along a casing/salt interface. The cracked interface is assumed to be fluid filled and fully pressurized by the cavern fluids. The analyses address the potential for the fluid path to extend upwards along a plugged casing should an open microannulus surround the casing after it is plugged.

0230 Properties and Composition

Refer also to citation(s) 11559, 11561, 12607

0250 Combustion

Refer also to citation(s) 11431, 11432, 11433, 11434, 11435, 11436, 11437, 11438

03 NATURAL GAS

11584 (DOE/FE–0297P) **Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States); USDOE Office of Energy Research, Washington, DC (United States); USDOE Energy Information Administration, Washington, DC (United States); USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States); USDOE Assistant Secretary for Policy, Planning and Program Evaluation, Washington, DC (United States). Dec 1993. 319p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008619. Source: OSTI; NTIS; GPO Dep.

DOE has established a Natural Gas Coordinating Committee to ensure that all natural gas programs are conducted with a single strategic focus and without unnecessary duplication. This group prepared the FY 1993 update of the DOE Natural Gas Strategic Plan and Multi-Year Crosscut Program Plan (FY 1993-1998), which was first produced a year ago as a "working draft" for industry comment. This revised version incorporates these external comments and the results and recommendations of such developments as Order No. 636 of the Federal Energy Regulatory Commission (FERC), the FERC/DOE Natural Gas Deliverability Task Force Report; the National Petroleum Council's 1992 natural gas study, The Potential for Natural Gas in the United States; relevant provisions of the EPACT, and new policy guidance from the Clinton Administration. The overall goal of the Natural Gas RD&D Program is to improve

the Nation's ability to supply, store, transport, distribute, and utilize gas in an economically efficient and environmentally beneficial manner. In support of DOE's missions are programs that will: improve the confidence in the continued availability of a long-term gas supply (Resource and Extraction Area); provide more cost-effective and competitive means to use natural gas in both new and existing markets (Utilization Area); develop improved and less costly means of delivering and storing gas (Delivery and Storage Area); and develop and ensure availability of low cost environmental compliance technology, and reduce regulatory barriers to efficient market operations by promoting coordinated, efficient, and innovative Federal and State regulations (Environmental/Regulatory Impact Area). Each program area has its own unique mission that contributes to the goals and mission of the overall Natural Gas Program.

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 11503, 11532, 11534, 11535, 11536

11585 (DOE/MC/28130–94/C0296) **Reserves in Western Basins.** Caldwell, R.H.; Cotton, B.W. Sotia Group, Dallas, TX (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-91MC28130. (CONF-931156–28: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007309. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to investigate the reserves potential of overpressured tight (OPT) gas reservoirs in three Rocky Mountain basins. These are the Greater Green River Basin (GGRB), Uinta Basin and Piceance Basin. By documenting productive characteristics in these basins and characterizing the nature of the vast gas resources in place, the reserves potential may be understood and quantified. Through this understanding, it is hoped that the oil and gas industry will be encouraged to pursue exploitation of this resource. At this point in time, the GGRB work has been completed and the final report submitted for publication. Work on the Uinta basin has just commenced and work on the Piceance basin will commence next year. Since the GGRB portion of this project has been completed, further discussion centers upon this Basin.

11586 (DOE/MC/30139–94/C0295) **Preliminary results on the characterization of Cretaceous and lower Tertiary low-permeability (tight) gas-bearing rocks in the Wind River Basin, Wyoming.** Fouch, T.D. (and others); Keefer, W.R.; Finn, T.M. Geological Survey, Denver, CO (United States). Petroleum Geology Branch. [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AT21-93MC30139. (CONF-931156–33: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007319. Source: OSTI; NTIS; GPO Dep.

The Wind River Basin is a structural and sedimentary basin in central Wyoming (Figure 1) that was created during the Laramide orogeny from Late Cretaceous through Eocene time. The objectives of the Wind River Basin tight gas sandstone project are to define the limits of the tight gas accumulation in the basin and to estimate in-place and recoverable gas resources. The approximate limits of the tight gas accumulation are defined from available drillhole information. Geologic parameters, which controlled the development of the accumulation, are studied in order to better understand the origins of tight gas accumulations, and to predict the limits of the accumulation in areas where little drillhole information is available. The architecture of sandstone reservoirs are studied in outcrop to predict production characteristics of similar reservoirs within the tight gas accumulation. Core and cuttings are used to determine thermal maturities, quality of source rocks, and diagenetic histories. Our work thus far has concentrated in the Wind River Indian Reservation in the western part of the basin.

0303 Drilling, Production, and Processing

Refer also to citation(s) 11575, 11582, 11585

11587 (DOE/ID/10412–7) **Reservoir engineering studies of the Gladys McCall geopressured-geothermal resource: Final report.** Chen-Min; Less, K.; Miller, M.A. Texas Univ., Austin, TX (United States). Dept. of Petroleum Engineering. Jan 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-85ID10412. Order Number DE94005890. Source: OSTI; NTIS; GPO Dep.

Transient pressure analysis techniques have been used to evaluate the performance of the Gladys McCall geopressured-geothermal reservoir. A fault-controlled aquifer influx model has also been developed to account for pressure support observed during both reservoir depletion and recovery phases. The Gladys McCall No. 1 well was drilled and completed in the lower Miocene geopressured sandstones under the US Department of Energy geopressured-geothermal research program. The well was shut in October 1987 after producing over 27 MMstb of brine and 676 MMscf gas since October 1983. Eight pressure transient tests were conducted in the well. Analysis of transient pressure data provided a quantitative evaluation of reservoir characteristics, including: (a) formation transmissibility and skin, (b) the size and possible shape of the main producing reservoir, and (c) characteristics of the pressure support mechanism. The pressure behavior of 1983 Reservoir Limits Test (RLT) suggested that the Gladys McCall reservoir might have a long narrow shape with the well located off-center. An elongated numerical model developed accordingly was able to reproduce the pressure characteristics shown in the test. During both the reservoir production and shut-in periods, pressure buildup tests indicated some degree of external pressure support. Aquifer recharging was believed to be the main source. Based on reservoir material-balance calculations, an aquifer influx model was derived from a conceptual model of water leakage through a partially sealing fault into the reservoir under steady-state conditions. Moreover, a match of the pressure history required that the conductivity of the fault be a function of the pressure difference between the supporting aquifer and the reservoir.

11588 (DOE/MC/25105–94/C0302) **Measurement-While-Drilling (MWD) development for air drilling.** Harrison, W.A.; Rubin, L.A. Geoscience Electronics Corp., Westlake Village, CA (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC25105. (CONF-931156–35: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007311. Source: OSTI; NTIS; GPO Dep.

When downhole contact between the BHA and formation was optimum, as it was during rotation, high signal levels were experienced. Survey data acquired at the connections, when the BHA was totally at rest, is excellent. GEC intends modifying the system to optimize operations consistent with these disparate factors. A Mean-Time-To-Failure (MTTF) of 89.9 hours appears reasonable from the data. It is not possible to infer an MTBF figure from this test. It is quite obvious, however, that the system reliability performance has been significantly improved since FT #5 was performed almost two years earlier. Based on the above results, GEC concludes that it is certainly feasible to attain 100 hours MTBF, for the Model 27, in any and all situations, and hence to provide a reliable MWD for air-drilling.

11589 (DOE/MC/26024–94/C0290) **Slant Hole Completion Test, Cozzette and Paludal production testing.** Mann, R.L.; Malinowsky, M.S. CER Corp., Las Vegas, NV (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC26024. (CONF-931156–31: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007308. Source: OSTI; NTIS; GPO Dep.

The Slant Hole Completion Test has been successful in providing good technology transfer to the oil and gas industry. The gas-producing rate from the Cozzette horizontal open-hole interval was significantly greater than from offset vertical wells. The source of water production from the Cozzette is not presently understood. Diagnosis of the water production mechanism is vital to economic exploitation of the Cozzette gas resource using horizontal well technology. Stimulation in a high-angle cased and cemented wellbore, such as the Paludal 2, 3 and 4 intervals in SHCT No. 1, is more difficult because of high near-wellbore stress that results in higher treating pressures. Low gas production potential following

the Paludal 2, 3 and 4 stimulation may result from damage to the natural fracture system resulting from casing cementing operations. Comparison of gas production rates in SHCT No. 1 and MWX No. 1 following similar stimulations in the Paludal 3 and 4 intervals, indicate there is no advantage to a hydraulic fracture treatment in a slant wellbore when compared to a vertical wellbore.

11590 (DOE/MC/28240–94/C0301) **Horizontal drilling in shallow reservoirs.** Murray, W.F. Jr.; Schrider, L.A.; McCallister, J.V.; Mazza, R.L. Belden and Blake Corp., North Canton, OH (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-91MC28240. (CONF-931156–36: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007310. Source: OSTI; NTIS; GPO Dep.

Belden & Blake and the US DOE will cofund a horizontal well to be drilled in the Clinton Sandstone as part of the DOE's multi well program titled "Horizontal Drilling in Shallow Geologic Complex Reservoirs." This well will be located in Mahoning County, Ohio in an area which has demonstrated above average Clinton gas production. To the best of our knowledge, this will be the first horizontal well drilled to the Clinton Sand formation in Ohio. Since many of the remaining Clinton Sand drilling sites are of poorer reservoir quality, they may not be developed unless technology such as horizontal drilling can be successfully demonstrated.

11591 (DOE/MC/29077–94/C0288) **Fracturing fluid characterization facility (FFCF).** Evans, R.D.; Roegiers, J.C.; Fagan, J. Oklahoma Univ., Norman, OK (United States). School of Petroleum and Geological Engineering. [1993]. 28p. Sponsored by USDOE, Washington, DC (United States);Gas Research Inst., Chicago, IL (United States). DOE Contract FC21-92MC29077. (CONF-931156–27: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007318. Source: OSTI; NTIS; GPO Dep.

The Fracturing Fluid Characterization Facility project has as its main focus the design, fabrication, and construction of a high pressure simulator (HPS) and a low pressure simulator (LPS) to be used to experimentaliy investigate the rheological properties and transport characteristics of proppant laden fracturing fluids. A discussion of each apparatus is provided as well as the auxiliary equipment, and data acquisition and control systems associated with the simulators.

11592 (DOE/MC/29470–3668) **Low-quality natural gas sulfur removal/recovery: Task 2: Topical report, September 30, 1992–August 29, 1993.** Cook, W.J. (Acrion Technologies, Inc., Cleveland, OH (United States)); Neyman, M.; Brown, W.; Klint, B.W.; Kuehn, L.; O'Connell, J.; Paskall, H.; Dale, P. CNG Research Co., Pittsburgh, PA (United States); Acrion Technologies, Inc., Cleveland, OH (United States); Bovar, Inc., Calgary, AB (Canada). Aug 1993. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29470. Order Number DE94004084. Source: OSTI; NTIS; GPO Dep.

The primary purpose of this Task 2 Report is to present conceptual designs developed to treat a large portion of proven domestic natural gas reserves which are low quality. The conceptual designs separate hydrogen sulfide and large amounts of carbon dioxide (>20%) from methane, convert hydrogen sulfide to elemental sulfur, produce a substantial portion of the carbon dioxide as EOR or food grade CO_2, and vent residual CO_2 virtually free of contaminating sulfur containing compounds. A secondary purpose of this Task 2 Report is to review existing gas treatment technology and identify existing commercial technologies currently used to treat large volumes of low quality natural gas with high acid content. Section II of this report defines low quality gas and describes the motivation for seeking technology to develop low quality gas reserves. The target low quality gas to be treated with the proposed technology is identified, and barriers to the production of this gas are reviewed. Section III provides a description of the Controlled Freeze Zone (CFG)-CNG technologies, their features, and perceived advantages. The three conceptual process designs prepared under Task 2 are presented in Section IV along with the design basis and process economics. Section V presents an overview of existing gas treatment technologies, organized into acid gas removal technology and sulfur recovery technology.

11593 (DOE/MC/30070–94/C0289) **Introduction to the GRI/DOE Field Fracturing Multi-Site Project.** Peterson, R.E.; Middlebrook, M.L.; Warpinski, N.R.; Cleary, M.P.; Branagan, P.T. CER Corp., Las Vegas, NV (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30070. (CONF-931156–34: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007320. Source: OSTI; NTIS; GPO Dep.

The objective of the Field Fracturing Multi-Sites Project is to conduct field experiments and analyze data that will result in definitive determinations of hydraulic fracture dimensions using remote well and treatment well diagnostic techniques. In addition, experiments will be conducted to provide data that will resolve significant unknowns with regard to hydraulic fracture modeling, fracture fluid rheology and fracture treatment design. These experiments will be supported by a well-characterized subsurface environment, as well as surface facilities and equipment that are conducive to acquiring high-quality data. it is anticipated that the primary benefit of the project experiments will be the development and widespread commercialization of new fracture diagnostics technologies to determine fracture length, height, width and azimuth. Data resulting from these new technologies can then be used to prove and refine the 3D fracture model mechanisms. It is also anticipated that data collected and analyzed in the project will define the correct techniques for determining fracture closure pressure. The overall impact of the research will be to provide a foundation for a fracture diagnostic service industry and hydraulic fracture optimization based on measured fracture response.

11594 (DOE/METC/C–94/7120) **CO_2/sand fracturing in Devonian shales.** Yost, A.B. II (USDOE Morgantown Energy Technology Center, WV (United States)); Mazza, R.L.; Gehr, J.B. USDOE Morgantown Energy Technology Center, WV (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). (CONF-931145–1: Eastern regional meeting of the Society of Petroleum Engineers: doing more with less, Pittsburgh, PA (United States), 2-4 Nov 1993). Order Number DE94007313. Source: OSTI; NTIS; GPO Dep.

A total of five carbon dioxide (CO_2)/sand well stimulations were successfully executed with two Devonian shale operators in Perry and Pike Counties, Kentucky. This new stimulation method offers a minimum formation damage proppant stimulation approach for natural gas producers in the United States. Some operators have been concerned about the frac fluid formation damage associated with the water and chemicals used in conventional foam stimulations, whereas other operators have been concerned about the lack of proppant in straight nitrogen fracs used by service companies today. Two carefully screened geological areas of established Devonian shale production were selected based on active ongoing drilling and completion operations. One selected control area contained an existing set of wells with established production histories. More specifically, one operator furnished three offset wells which were stimulated with the carbon dioxide/sand frac method. The quantity of proppant and fluids pumped during each well stimulation ranged from 23,000 to 43,000 pounds of proppant and from 120 to 160 tons of liquid carbon dioxide. Another operator furnished two offset wells which were each stimulated with approximately 47,000 pounds of proppant and 120 tons of carbon dioxide. The logistics and field layout of a typical carbon dioxide/sand frac treatment has been described and highlighted. The importance and unique aspects of the closed system blender that is required for job execution is discussed. Five stimulation treatments have been reviewed, and stimulation and preliminary production data compared to offset wells stimulated with nitrogen, and explosives. Initial production results indicate more than a 50 percent increase in production rate compared to nitrogen fraced wells in the Pike County area.

0304 Products and By-Products

Refer also to citation(s) 12772

11595 (DOE/PC/92111–T4) **Conversion of light hydrocarbon gases to metal carbides for production of liquid fuels and**

chemicals: Quarterly technical status report, July 1–September 30, 1993. Diaz, A.F.; Modestino, A.J.; Howard, J.B.; Tester, J.W.; Peters, W.A. Massachusetts Inst. of Tech., Cambridge, MA (United States). Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92111. Order Number DE94008384. Source: OSTI; NTIS; GPO Dep.

The construction of the thermal plasma reactor is nearing completion. During the reporting period, work has concentrated on the design and construction of the plasma reactor and on procurement of related accessories for process monitoring and safety. With the plasma gun system mounted in the cooling chamber assembly inside the fragmentation containment room and with the cooling water system in place, a test-firing of the arc discharge with Argon was conducted in late September. This test, unfortunately, resulted in burn-out of some parts of the plasma gun apparently due to arcing outside of the inter-electrode region, setting back the projected date for completing apparatus construction. Options for a powder feeder investigated include scale-up of a home-made fluidized bed syringe feeder, used at MIT for delivering coal to a drop-tube furnace, and the employment of a mechanical wheel-type feeder sold by Miller Thermal, Inc., of Appleton, WI, which gave a promising demonstration run at MIT. The idea of using an Argon plasma as a heat source in carrying out mechanistic studies was also considered. Thus, the plasma reactor, once completed, might be useful for this purpose as well. Future plans are to rebuild the plasma gun, to assemble a sample collection system, and to continue installing safety and process monitoring equipment. The goals for the next period are to test-fire the gun successfully with Argon, to complete and test the sample collection system with an operating inert gas plasma, and then to perform a scoping run with methane and MgO/CaO powders delivered to the plasma.

0305 Health and Safety

Refer also to citation(s) 11563

0306 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11568, 11569, 11570, 11571, 11572

11596 (DOE/EIA–0130(94/02)) **Natural gas monthly, February 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 25 Feb 1994. 145p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007906. Source: OSTI; NTIS; GPO; GPO Dep.

The NGM highlights activities, events, and analyses of interest to public and private sector organizations associated with the natural gas industry. Volume and price data are presented each month for natural gas production, distribution, consumption, and interstate pipeline activities. Producer-related activities and underground storage data are also reported. The NGM also features articles designed to assist readers in using and interpreting natural gas information.

0307 Waste Management

Refer also to citation(s) 11574, 11575

0308 Environmental Aspects

Refer also to citation(s) 11576

11597 (DOE/MC/30246–3617) **Advanced turbine systems program: Conceptual design and product development: Topical report, November 1993.** Wilken, L.S. Solar Turbines, Inc., San Diego, CA (United States). Product Development Center. Jan 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30246. Order Number DE94004058. Source: OSTI; NTIS; GPO Dep.

This report has been prepared by Solar Turbines Incorporated (Solar) in accordance with Task 2 of the Advanced Turbine Systems (ATS) Contract. This report addresses only the work that will be performed under Task 8 (Design and Test of Critical Components) of the Contract. The discussion is divided into four general sections: Project Description; Potential Environmental Impacts; Required Permits and Licenses; and Environmental, Safety and Health (ES and H) Agency Contact Information. As described in further detail herein, the activities to occur during the project (i.e., Task 8) consists primarily of short duration testing of laboratory-scale components (or portions of components) for the ATS program. The testing involved will fall in the following general categories: recuperator, combustor, and blade/airfoil cooling. All activities contemplated will occur at existing facilities. Solar believes that the information in this report supports the conclusion that no significant environmental impacts will be associated with the project.

0310 Legislation and Regulations

Refer also to citation(s) 11577

0320 Transport, Handling, and Storage

Refer also to citation(s) 11579, 11582

0340 Combustion

Refer also to citation(s) 11917

04 OIL SHALES AND TAR SANDS

0404 Oil Production, Recovery, and Refining

11598 (DOE/BC/14479–16) **Chemically assisted in situ recovery of oil shale.** Ramierz, W.F. Colorado Univ., Boulder, CO (United States). Dept. of Chemical Engineering. [1993]. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-89BC14479. Order Number DE94007803. Source: OSTI; NTIS; GPO Dep.

The purpose of the research project was to investigate the feasibility of the chemically assisted in situ retort method for recovering shale oil from Colorado oil shale. The chemically assisted in situ procedure uses hydrogen chloride (HCl), steam (H_2O), and carbon dioxide (CO_2) at moderate pressure to recovery shale oil from Colorado oil shale at temperatures substantially lower than those required for the thermal decomposition of kerogen. The process had been previously examined under static, reaction-equilibrium conditions, and had been shown to achieve significant shale oil recoveries from powdered oil shale. The purpose of this research project was to determine if these results were applicable to a dynamic experiment, and achieve penetration into and recovery of shale oil from solid oil shale. Much was learned about how to perform these experiments. Corrosion, chemical stability, and temperature stability problems were discovered and overcome. Engineering and design problems were discovered and overcome. High recovery (90% of estimated Fischer Assay) was observed in one experiment. Significant recovery (30% of estimated Fischer Assay) was also observed in another experiment. Minor amounts of freed organics were observed in two more experiments. Penetration and breakthrough of solid cores was observed in six experiments.

11599 (DOE/MC/27286–94/C0281) **Oil and gas yields from devonian oil shale in the 50-lb/hr KENTORT II process demonstration unit: Initial results.** Robl, R.L.; Carter, S.D.; Taulbee, D.N. Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research. [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC27286. (CONF-931156–39: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007305. Source: OSTI; NTIS; GPO Dep.

The broad objective of this program is to perform the research necessary to design, construct, test, and optimize the KENTORT II process at the 50-lb/hr scale. Many of our objectives have already been realized. The retort has been successfully constructed and the shakedown phase is essentially complete. In addition, much of the coking and cracking kinetics experiments have been completed which will provide important information for the operation of the retort. We are now entering the testing phase for the retort which has

the following objectives: Determine any relationships between the retorting conditions and the yield and characteristics of the products, and compare the results to those from the bench-scale shale oil cracking and coking experiments; study and develop alternative applications for the products from the KENTORT II process. In particular, asphalt performance tests will be conducted on the heavy fraction of oil produced during the testing phase.

11600 (DOE/NBM–94000080) **Status of LLNL Hot-Recycled-Solid oil shale retort.** Baldwin, D.E.; Cena, R.J. Lawrence Livermore National Lab., CA (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931156–37: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94000080. Source: OSTI; NTIS; GPO Dep.

We have investigated the technical and economic barriers facing the introduction of an oil shale industry and we have chosen Hot-Recycled-Solid (HRS) oil shale retorting as the primary advanced technology of interest. We are investigating this approach through fundamental research, operation of a 4 tonne-per-day, HRS pilot plant and development of an Oil Shale Process (OSP) mathematical model. Over the last three years, from June 1991 to June 1993, we completed a series of runs (H10–H27) using the 4-TPD pilot plant to demonstrate the technical feasibility of the HRS process and answer key scale-up questions. With our CRADA partners, we seek to further develop the HRS technology, maintain and enhance the knowledge base gained over the past two decades through research and development by Government and industry and determine the follow on steps needed to advance the technology towards commercialization. The LLNL Hot-Recycled-Solid process has the potential to improve existing oil shale technology. It processes oil shale in minutes instead of hours, reducing plant size. It processes all oil shale, including fines rejected by other processes. It provides controls to optimize product quality for different applications. It co-generates electricity to maximize useful energy output. And, it produces negligible SO_2 and NO_x emissions, a non-hazardous waste shale and uses minimal water.

0405 Properties and Composition

11601 (CONF-931156–29) **Shale oil from the LLNL pilot retort: Metal ions as markers for water and dust.** Coburn, T.T.; Duewer, T.I.; King, K.J.; Baldwin, D.E.; Cena, R.J. Lawrence Livermore National Lab., CA (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. From Fuels technology contractors' review meeting; Morgantown, WV (United States); 16-18 Nov 1993. Order Number DE94000081. Source: OSTI; NTIS; GPO Dep.

A metal ion found primarily in one of the three phases (oil, water, or dust) can serve as a marker for that phase. Emulsified water contains most of the magnesium detected in a shale oil. Extraction with saturated salt solution removes most of that Mg. The Mg content of retort water and the percentage of water in the oil (by ASTM D-4006) provides a good estimate of an oil's Mg content. Mineral matter elements with poorly water soluble carbonates (or oxides) at pH 8 (calcium, for example) serve as markers for dust. When the water is separated from the main and light oil fractions before adding the heavy fraction containing dust, a much drier oil can be obtained. However, when done in this way, a powder containing Ca and Si remains in the oil; it cannot be completely removed even by filtering through a 0.24-μ frit. Iron, and certain other transition metal ions, is quite oil soluble. Extraction with dilute nitric acid to remove basic amines reduces the Fe content of shale oil. Unlike carboxylate- complexed metal ions in crude oils, the iron in shale oil does not extract efficiently into an aqueous EDTA solution (pH 5.9). Distillation of shale oil leaves most of the iron and other metals behind in the vacuum residum. Shale oil corrodes the hottest condenser's steel interior; this is the chief source of iron in the oil.

0406 Products and By-Products

11602 (DOE/MC/29240–94/C0280) **Shale oil value enhancement research: Separation characterization of shale oil.** Bunger, J.W. Bunger (James W.) and Associates, Inc., Salt Lake City, UT (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC29240. (CONF-931156–38: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007304. Source: OSTI; NTIS; GPO Dep.

The overall objective is to develop a new technology for manufacturing valuable marketable products form shale oil. Phase-I objectives are to identify desirable components in shale oil, develop separations techniques for those components, identify market needs and to identify plausible products manufacturable from raw shale oil to meet those needs. Another objective is to conduct preliminary process modeling and economic analysis of selected process sequences and product slates, including an estimation of process, costs and profitability. The end objective of Phase-I is to propose technically and economically attractive separations and conversion processes for small-scale piloting in the optional Phase-II. Optional Phase-II activities include the pilot-scale test of the Shale Oil Native Products Extraction (SO-NPX) technology and to produce specification products. Specific objectives are to develop the engineering data on separations processing, particularly those in which mixtures behave non-ideally, and to develop the conversion processes for finishing the separations concentrates into specification products.The desired process scenarios will be developed and economic analysis will be performed on the process scenarios. As a result of the process simulation and economic analysis tasks, a product manufacture and test marketing program shall be recommended for the optional Phase-III. Optional Phase-III activities are to manufacture specification products and to test market those products in order to ensure market acceptability. The activities involve the assembling of the technical, market and economic data needed for venture evaluation. The end objective is to develop the private sector interest to carry this technology forward toward commercialization.

0407 Health and Safety

Refer also to citation(s) 11530

05 NUCLEAR FUELS

11603 (EUR–15154) **Annual Report 1992.** Commission of the European Communities, Luxembourg (Luxembourg). 1993. 243p. Source: OSTI; NTIS (US Sales Only); INIS.

This presents research programmes and investigations of Institute for Transuranium Elements. In Basic Safety Research on Nuclear Fuels, studies of fracture and evaporation behaviour of UO_2, simulating different degrees of burn-up, were continued. The Study of Safety Aspects of Fuel Operation and Handling dealt with operational limits of advanced fuels and transport/dispersion of radioactive aerosol particles in nuclear facilities. Actinide Determination and Recycling activities were mainly concerned with evaluation of technical possibilities to transmute long-lived nuclear waste constituents into shorter-lived fission products. Results of an earlier irradiation test were evaluated, and minor-actinide containing oxide fuel pins which had been irradiated in PHENIX reactor were analysed. Progress was made in Characterization of Waste Forms and of High Burn-Up Fuel. In the context of efforts to model the consequences of water intrusion into an underground fuel deposit (Project COCAIN), existing models (FUTURE, MITRA, CHEMIF) were adapted and used to characterize the initial state of an LWR fuel which had been subject to several irradiation cycles. In Actinide Research the accent was on the preparation and on structural and physical studies of actinide compounds with heavy fermion properties and with a particular magnetic behaviour. Experimental investigations on the attenuation of sound waves by aerosols and theoretical studies concerning the optimization of acoustic cavities for aerosol conditioning were carried out during the reporting period under the heading Exploratory Research. Support to the Directorate General XVII (Energy) on safeguarding fissile materials concentrated on the preparation of work in on-site analytical laboratories in Sellafield and La Hague. In this context, a portable compact K-edge absorption spectrometer was constructed

and an expert system for the evaluation of safeguards measurement results was developed. (author).

0501 Reserves, Exploration, and Mining

11604 (DOE/EI/23956–T1) **Maintaining the Uranium Resource Assessment Data System and assessing the 1992 US uranium potential resources: Final report.** Finch, W.I.; Grundy, W.D.; Pierson, C.T.; Kork, J.O. Geological Survey, Denver, CO (United States). 31 Dec 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-93EI23956. Order Number DE94007020. Source: OSTI; NTIS; GPO Dep.

For 1992, estimates of US undiscovered uranium resources were generated using revised economic index values (current to December 1992) in the Uranium Resources Assessment Data (URAD) System's cost model. The endowments associated with the Estimated Additional Resources (EAR) and Speculative Resources (SR) values for all regions are unchanged from the 1991 values. Although higher 1992 indexes resulted in increased costs, the mean values for the $30-, $50-, and $ 100-per pound U308 forward-cost EAR category resources for 1992 show no significant changes when compared to the values in 1991. The mean values for the $30-, $50-, and $100-per pound U_3O_8 forward-cost SR forward-cost category show decreases of 4, 3, and 1 percent, in the three categories respectively. Under the Memorandum of Understanding (MOU) between the Energy Information Administration (EIA), US Department of Energy, and the US Geological Survey (USGS), US Department of the Interior, the USGS develops estimates of uranium endowment for selected geological environments in the United States. New estimates of endowment are used to update the URAD System that is maintained for the EIA by the USGS. Endowment estimates were added for the solution-collapse breccia pipe uranium deposits in the Grand Canyon region in 1989 and for young surficial uranium deposits in the Flodelle Creek area in Washington in 1991. Estimates of uranium endowment for roll-front uranium deposits in northwestern Nebraska and adjacent states are nearly completed and will be added in 1994. Assessment of undiscovered uranium endowment in new areas by the USGS will be discontinued in FY 1995 due to phasing out of the uranium resources program in FY 1994. Improvements to the URAD System included automating the procedures necessary to generate the assessment reports. Data retrieval from the URAD System can now be performed using dBase IV version 1.5 data base management system.

11605 (EUR–14659) **A new approach for the high-precision determination of the elemental uranium concentration in uranium ore by gamma-ray spectrometry.** Nagel, W. (Commission of the European Communities, Geel (Belgium). Central Bureau for Nuclear Measurements); Quik, F. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 46p. Source: OSTI; NTIS (US Sales Only); INIS.

A new approach for the determination of elemental uranium in uranium bearing ore, using high resolution gamma-ray spectrometry, was applied. Using a variant of the enrichment meter technique an agreement of better than 1% has been obtained between gamma-ray measurement results and the certified value obtained by other analytical methods. For the calibration of the gamma-ray spectrometer uranium reference samples have been used which are made available jointly in Europe and the USA as Certified Reference Materials for Gamma-ray Spectrometry (EC NRM 171 and NBS SRM 969, respectively). The measured ore has been put in a special designed container which ensured in all directions seen from the radiation window a uniform degree of infinite thickness of about 95%. The measurement results can be taken as an example for the applicability of gamma-ray spectrometry when high accuracy is required and under conditions where homogeneous distributed elemental uranium is embedded in a larger amount of matrix material. (author). 8 refs., 10 figs., 2 tabs., 2 appendices.

0504 Feed Processing

Refer also to citation(s) 11613

11606 (HW–32726-RD) **Notes on nitric acid oxide absorption system.** Ingalls, W.P. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. Sep 1954. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006974. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this document is to present a capacity study of the existing UO_3 Plant Nitric Oxide Absorption System.

11607 (HW–50081) **Uranium oxide activation cost study.** McKee, R.W. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 23 Apr 1957. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007750. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Owing to continuous uranyl nitrate calcining facilities at Hanford, the reactivity of the A oxide produced was reduced, with lower conversion to UF_4. A process design was developed for increasing the A_3O_8 activity by fluidized-bed reduction to UO_2 and reoxidation to A_3O_8. Justification for the installation would be in the $250,000 to $300,000 saved in not needing additional fluorine cells and $310,000 per year operating cost savings. The installation would cost $700,000 or $860,000; operating cost would be $270,000 per year. It was concluded that a full-scale process cannot be justified at the time of the study.

11608 (INIS-BR–3260) **Study of a bacterial leaching program for uranium ores by Thiobacillus ferroxidans.** Garcia Junior, O. Universidade Estadual de Campinas, SP (Brazil). Inst. de Biologia. 1989. 274p. (In Portuguese). Order Number DE94617489. Source: OSTI; NTIS (US Sales Only); INIS.

The development of a bacterial leaching program for uranium ores is studied. Three basic points are presented: isolation and purification of Thiobacillus ferroxidans, as well Thiobacillus thio oxidans; physiological studies of growth and respiratory metabolism of T. ferroxidans; uranium leaching from two types of ore by T. ferroxidans action, on laboratory, semi pilot and pilot scales. The bacterial leaching studies were carried out in shake flasks, percolation columns (laboratory and semi pilot) and in heap leaching (pilot). The potential of the ores studied in relation to bacterial action, was first showed in shake flask experiments. The production of H_2 S O_4 and Fe^{3+} was a result of the bacterial activity on both ore samples containing pyrite (Fe S_2). These two bacterial products resulted in a high uranium and molybdenum extraction and a lower sulfuric acid consumption compared to the sterilized treatments. Similar results were obtained in percolation column at the same scale (lab). (author).

0505 Uranium Enrichment

Refer also to citation(s) 11870

11609 (NUREG–1491) **Safety Evaluation Report for the Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070).** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Fuel Cycle Safety and Safeguards. Jan 1994. 372p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This report documents the US Nuclear Regulatory Commission (NRC) staff review and safety evaluation of the Louisiana Energy Services, L.P. (LES, the applicant) application for a license to possess and use byproduct, source, and special nuclear material and to enrich natural uranium to a maximum of 5 percent U-235 by the gas centrifuge process. The plant, to be known as the Claiborne Enrichment Center (CEC), would be constructed near the town of Homer in Claiborne Parish, Louisiana. At full production in a given year, the plant will receive approximately 4,700 tonnes of feed UF_6 and produce 870 tonnes of low-enriched UF_6, and 3,830 tonnes of depleted UF_6 tails. Facility construction, operation, and decommissioning are expected to last 5, 30, and 7 years, respectively. The objective of the review is to evaluate the potential adverse impacts of operation of the facility on worker and public health and safety under both normal operating and accident conditions. The review also considers the management organization, administrative programs, and financial qualifications provided to assure safe design

and operation of the facility. The NRC staff concludes that the applicant's descriptions, specifications, and analyses provide an adequate basis for safety review of facility operations and that construction and operation of the facility does not pose an undue risk to public health and safety.

0507 Fuels Production and Properties

Refer also to citation(s) 11763, 12207, 12218, 12222, 12460, 12578, 12697, 12721, 12733

11610 (HW–27796) **Operational characteristics of the Purex and Redox plutonium continuous concentrator package.** Sloat, R.J. Hanford Works, Richland, WA (United States). 21 Apr 1953. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006712. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The continuous plutonium concentration facilities proposed for the Purex Plant consist of a stripper-concentration unit in which the organic is removed and a portion of the required evaporation is accomplished, plutonium concentrator (No. 1 Pu Conc.) in which the final plutonium concentrate is produced, and a second concentrator which re-evaporates the totally condensed overhead from the No. 1 Pu Concentrator. In this report the Purex concentration "package" has been examined to determine whether the design is suitable for concentrating the various Redox 3BP solutions which may be produced (variable nitric acid to plutonium ratios) during operation at Redox Phase II processing rates. In Appendix A a short-cut method is presented for the calculation of the operating conditions to be employed around the No. 1 and No. 2 Pu concentrators to produce a desired Pu-HNO_3 product stream from a given feed solution. This method is considerably simpler than the trial-and-error solutions generally employed for such problems.

11611 (HW–31864) **Uranium blending.** Smith, A.E. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 17 May 1954. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006973. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. URANIUM/mixing; SAVANNAH RIVER PLANT; URANIUM; MIXING; CONCENTRATION RATIO; PLUTONIUM 240; DISSOLVERS; SEPARATION PROCESSES

11612 (HW–33048) **TBX plant study.** Johnson, H.G. Hanford Works, Richland, WA (United States). 16 Sep 1954. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006715. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A new separations plant using a Purex type flow sheet has been proposed for the 200-West area. The proposed plant, which has been named TBX, would replace the two bismuth phosphate type plants, but it would use existing 200-T and 200-U area facilities. Substantial savings in operating costs, a potential capacity increase for the 200-Areas, and a reduction in plutonium losses are incentives for making the change.

11613 (HW–33099) **4-X program: UO_3 plant expansion.** Ingalls, W.P. Hanford Works, Richland, WA (United States). 16 Sep 1954. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006975. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. NUCLEAR FACILITIES/modifications; NUCLEAR FACILITIES/capacity; URANIUM TRIOXIDE; MODIFICATIONS; CAPACITY; PRODUCTION; FEED MATERIALS PLANTS; SEPARATION EQUIPMENT

11614 (HW–35055) **Addendum to Production Test 221-T-19 reduction of time cycle in dissolver section.** Schmidt, W.C. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 9 Feb 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94005917. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD RESERVATION/separation processes; URANIUM/separation processes; PLUTONIUM/separation processes; DISSOLVERS; URANIUM; PLUTONIUM; FLOWSHEETS; PROCESS CONTROL; TESTING

11615 (HW–36371-RD) **Purex pulse column designs for capacity factor of 3.0 to 3.5.** Richardson, G.L. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 12 Apr 1955. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006686. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum indicates the Purex-Plant pulse-column and pulse- generator revisions which would be required to assure an instantaneous capacity of 25 tons U/day with a 20% capacity safety margin under Purex HW #3 Flowsheet conditions. (The use of the Purex HW #4 Flowsheet (6) with the revised columns would be expected to increase the capacity to 29 or 30 tons U/day.) The indicated design changes are recorded here for study and for possible reference if need for increased production capacity should arise. No recommendation for adoption at this time is made.

11616 (HW–37228) **Redox internal capacity improvement.** Beaulieu, O.F. Hanford Works, Richland, WA (United States). 9 Jun 1955. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006977. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This review indicates the present limiting capacities within the Redox plant and presents courses of action necessary to realize an instantaneous rate of 12/TD. The changes contemplated to reach this goal are time cycle reductions, procedural changes, and equipment changes which can be undertaken and achieved by the Redox organization presumably without recourse to project funds or special authorizations. The review proceeds systematically from the dissolvers, through head and, the extraction columns, concentrators, tail end equipment, and auxiliary equipment.

11617 (HW–38881) **A Purex process two cycle plant study.** Fecht, J.B.; Jaske, R.T.; Lane, T.V.; Ludlow, J.O. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Sep 1955. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006682. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Major additions to separations facilities may be required because of increased reactor power levels, reduced exposures; changes in slug specifications, obsolescence of existing solvent extraction plants or development of new separations processes with lower operating costs. The magnitude of first costs for a separations plant is so large as to discourage production planning which would require an additional major separations facility. Experience in separations design has shown that certain process and equipment changes, if they could be developed, would significantly reduce the capital investment in a separations facility. Accordingly design development for a new separations facility is under way. The purposes of this document are to present the results of the first separation design study directed toward a new solvent extraction plant and to summarize process, plant, and equipment changes which should be developed to achieve significant capital and operating cost reduction.

11618 (HW–39872) **A Purex process one cycle plant study.** Fecht, J.B.; Jaske, R.T.; Lane, T.V.; Ludlow, J.O. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 12 Dec 1955. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006699. Source: OSTI; NTIS (US Sales Only); GPO Dep.

In keeping with the announced goals for production at Hanford, a series of separations plant studies is being conducted with the objective of providing an insight into worthwhile design development goals both process and plant-wise. These studies will provide a basis for evaluation of research and development programs, with all cost estimates and other supporting information standardized, both in presentation and detail. These developments are vital to the future of separations plant planning in order that proper emphasis be placed on the most economic production facility for HAPO, should production planning require an additional major facility. This report is the second of a series, reporting on the design developments under way. The purposes of this document are to present the results of the second separations plant design study directed toward

a new solvent extraction plant and to summarize process, plant, and equipment changes which should be developed to achieve the significant capital and operating cost reductions indicated.

11619 (HW–42978) **High-capacity Purex study flowsheet.** Platt, A.M. Hanford Works, Richland, WA (United States). 14 Jun 1956. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (HAN–63570). Order Number DE94006685. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Current best estimates of HAPO reactor performance for 1960 to 1962 indicate that uranium might be irradiated and discharged at rates considerably in excess of the established capacities of the Redox and Purex Plants. Alternate methods of increasing separations capacity include construction of a new plant, operation of the $BiPO_4$ and TBP Plants, substitution of a Redox flowsheet in the Purex Plant, and increasing the capacities of the Purex and Redox Plants-either as integral units or in combination with each other or with 221-U. Information on the first three proposals listed has been published.

11620 (HW–55590) **Hanford Laboratories Operation monthly activities report, March 1958.** Parker, H.M. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Apr 1958. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006073. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This is the monthly report for the Hanford Laboratories Operation, March, 1958. Metallurgy, reactor fuels, chemistry, dosimetry, separation processes, reactor technology, financial activities, visits, biology operation, physics and instrumentation research, and employee relations are discussed.

11621 (HW–66916) **Design scope of the Z Plant Plutonium Reclamation Facility: Project CAC-880.** Braden, D.E. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 17 Oct 1960. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006698. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this document is to present the Title I scope design which will constitute the basis for Title II detail design of the Plutonium Reclamation Facility.

11622 (HW–77942) **Recommended MWD factors for tritium yield predictions.** Handshuh, J.W.; Vaughn, A.D. Hanford Works, Richland, WA (United States). 18 Jun 1963. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007893. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document is a recommendation to change the MWD factors used by Production Computing Operation, IPD, to calculate Tritium yields from target fuel irradiated in the Hanford Production Reactors. The linear Tritium yield equations in the Nuclear Materials computer programs will not be affected by this change.

11623 (HW–79468) **Fuel element performance.** Hagie, L.T. Hanford Works, Richland, WA (United States). 31 Dec 1957. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007895. Source: OSTI; NTIS (US Sales Only); GPO Dep.

For some time, it has been considered that cycling natural uranium fuel elements through the α-β transformation point (approx. 662 C) is a contributing factor in split type ruptures. This hypothesis is based upon the fact that the transition temperature, a one percent increase in volume occurs. It is reasoned that as the uranium hardens under irradiation, it becomes progressively less able to adjust to the severe stresses imposed by the volume change as the material cycles through the α-β transformation point. Failure finally occurs by a splitting of the core. The IPD is now interested in evaluating some of the effects of reactor operation upon fuel performance. It appears that the life of solid fuel elements may be prolonged if sudden changes in reactor operation can be minimized. It is the purpose of this report to bring to the attention of FPD management the new ideas being developed in the IPD on split type failures and to point out the effect such thinking may have on future fuel element development activities. Based on a discussion with personnel in PID, there is reasonable hope that the performance of solid fuel elements will not be limited by the α-β transformation, and that the solid geometry can be used to advantage in all HAPO production reactors.

11624 (JAERI-M–93-222) **Fabrication test of thoria tube.** Nakamura, Takehiko (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Hashimoto, Kazuichiro; Uetsuka, Hiroshi; Nishino, Yasuharu; Suzuki, Nobuyuki. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 69p. (In Japanese). Order Number DE94748661. Source: OSTI; NTIS; INIS.

An experimental research on fission product release from Light Water Reactor (LWR) fuels under accident conditions at high temperatures is planned and being prepared in Japan Atomic Energy Research Institute (JAERI), which is important for evaluating the impacts of the design base events and the severe accidents of the LWRs. Short segments of irradiated LWR fuels will be induction-heated in the tests. The release behavior of the fission products is going to be studied as a function of temperature under various atmospheres. Very stable material is required for the induction furnace which stands for high temperatures exceeding 2800 degC under oxidizing or reducing atmospheres. Thorium dioxide (Thoria) which has a very high melting point of 3370 degC and chemically stable at high temperatures is a strong candidate. However, because thorium is controlled by the government as nuclear fuel material, experiences of fabricating thoria components are very limited except for the uses as the nuclear fuels. Fabrication tests of thoria tubes from thoria powder were conducted to clarify the fabrication parameters. A thoria tube of outer diameter of about 35mm, inner diameter of about 24mm, length of about 145mm at density of about 90% to the theoretical, was successfully fabricated from the powder by rubber pressing and sintering. (author).

0508 Spent Fuels Reprocessing

Refer also to citation(s) 11662, 11796, 11797, 11824, 12549, 12595

11625 (ANL/CMT/CP–80021) **Waste removal in pyrochemical fuel processing for the Integral Fast Reactor.** Ackerman, J.P.; Johnson, T.R.; Laidler, J.J. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940204–3: 94. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94005388. Source: OSTI; NTIS; INIS; GPO Dep.

Electrorefining in a molten salt electrolyte is used in the Integral Fast Reactor fuel cycle to recover actinides from spent fuel. Processes that are being developed for removing the waste constituents from the electrorefiner and incorporating them into the waste forms are described in this paper. During processing, halogen, chalcogen, alkali, alkaline earth, and rare earth fission products build up in the molten salt as metal halides and anions, and fuel cladding hulls and noble metal fission products remain as metals of various particle sizes. Essentially all transuranic actinides are collected as metals on cathodes, and are converted to new metal fuel. After processing, fission products and other waste are removed to a metal and a mineral waste form. The metal waste form contains the cladding hulls, noble metal fission products, and (optionally) most rare earths in a copper or stainless steel matrix. The mineral waste form contains fission products that have been removed from the salt into a zeolite or zeolite-derived matrix.

11626 (ANL/CMT/CP–81050) **Pyrometallurgical processes for recovery of actinide elements.** Battles, J.E.; Laidler, J.J.; McPheeters, C.C.; Miller, W.E. Argonne National Lab., IL (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940215–4: International symposium on actinides: processing and materials, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94005385. Source: OSTI; NTIS; INIS; GPO Dep.

A metallic fuel alloy, nominally U-20-Pu-IOZr, is the key element of the Integral Fast Reactor (IFR) fuel cycle. Metallic fuel permits the use of an innovative, simple pyrometallurgical process, known

as pyroprocessing, (the subject of this report), which features fused salt electrorefining of the spent fuel. Electrorefining separates the actinide elements from fission products, without producing a separate stream of plutonium. The plutonium-bearing product is contaminated with higher actinides and with a minor amount of rare earth fission products, making it diversion resistant while still suitable as a fuel material in the fast spectrum of the IFR core. The engineering-scale demonstration of this process will be conducted in the refurbished EBR-II Fuel Cycle Facility, which has entered the start-up phase. An additional pyrometallurgical process is under development for extracting transuranic (TRU) elements from Light Water Reactor (LWR) spent fuel in a form suitable for use as a feed to the IFR fuel cycle. Four candidate extraction processes have been investigated and shown to be chemically feasible. The main steps in each process are oxide reduction with calcium or lithium, regeneration of the reductant and recycle of the salt, and separation of the TRU product from the bulk uranium. Two processes, referred to as the lithium and salt transport (calcium reductant) processes, have been selected for engineering-scale demonstration, which is expected to start in late 1993. An integral part of pyroprocessing development is the treatment and packaging of high-level waste materials arising from the operations, along with the qualification of these waste forms for disposal in a geologic repository.

11627 (ANL/FC/CP–79712) **Actinide recovery techniques utilizing electromechanical processes.** Westphal, B.R.; Benedict, R.W. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940204–2: 94. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94005387. Source: OSTI; NTIS; INIS; GPO Dep.

Under certain conditions, the separation of actinides using electromechanical techniques may be an effective means of residue processing. The separation of granular mixtures of actinides and other materials discussed in this report is based on appreciable differences in the magnetic and electrical properties of the actinide elements. In addition, the high density of actinides, particularly uranium and plutonium, may render a simultaneous separation based on mutually complementary parameters. Both high intensity magnetic separation and electrostatic separation have been investigated for the concentration of an actinide waste stream. Waste stream constituents include an actinide metal alloy and broken quartz shards. The investigation of these techniques is in support of the Integral Fast Reactor (IFR) concept currently being developed at Argonne National Laboratory under the auspices of the Department of Energy.

11628 (CEA-CONF–11423) **Extraction chemistry of actinide cations by N,N,N',N'-tetraalkyl-2 alkyl propane-1,3 diamides.** Nigond, L.; Musikas, C.; Cuillerdier, C. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 11p. (CONF-9304213–: Actinides meeting, Buehl (Germany), 20-23 Apr 1993). Order Number DE94617497. Source: OSTI; NTIS (US Sales Only); INIS.

N, N, N', N'-tetraalkyl 2-alkyl propane 1,3-diamides $(RR'NCO)_2$ CHR were investigated in view to separate the actinides contained in nuclear wastes. These extractants can be considered as an alternative to CMPO (octyl(phenyl)-N, N-diisobutylcarbamoyl methyl phosphine oxide) used in the TRUEX process [1]. Unlike organophosphorus molecules, amides and their degradation products are completely incinerable. These facts implicate minimum production of secondary wastes after the degraded solvent incineration. N, N'-dimethyl N, N'-dibutyl tetradecyl malonamide (DMDBTDMA) was selected. This molecule is usable in aliphatic diluents, is able to extract trivalent actinides. Americium extraction is faster than iron extraction, this phenomenon increases the interest of these solvents in nuclear industry. We will present extraction equilibria of UO_2^{2+}, Pu^{4+}, and Am^{3+} from nitrate solutions. Researches are performed to point out the main features of complexes (amidecation) providing extraction (different species, stoechiometries, part of acidity). Technics used are spectrophotometry (IR, UV-visible), distribution ratios measurements and saturation of the organic phase. (author). 6 figs.

11629 (CEA-CONF–11678) **Advanced Purex process for the new French reprocessing plants.** Viala, M. (CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement); Bernard, C.; Moulin, J.P.; Ledermann, P.; Pradel, P. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 6p. (CONF-930913–: Global '93: future nuclear systems - emerging fuel cycles and waste disposal options, Seattle, WA (United States), 12-17 Sep 1993). Order Number DE94617498. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes the main process innovations of the new Cogema reprocessing plants of La Hague (UP3 and UP2 800). Major improvements of process like the use of rotary dissolvers and annular columns, and also entirely new processes like solvent distillation and plutonium oxidizing dissolution, yield an advanced Purex process. The results of these innovations are significant improvements for throughput, end-products purification performances and waste minimization. They contribute also to limit personnel exposure. The main results of the first three years of operation are described. (author). 3 refs., 5 figs.

11630 (CEA-R–5647) **Application of steric exclusion chromatography for the separation of degradation products of the solvent used for the reprocessing of the nuclear fuels.** Pozo, C. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. Aug 1993. 151p. (In French). Order Number DE94617499. Source: OSTI; NTIS (US Sales Only); INIS.

The solvent, used in France in Purex reprocessing plants at La Hague is tributylphosphate (TBP) diluted to 30% with a mixture of branched alkanes, for which the main component is branched dodecane (70%). In order to minimize volumes of organic wastes, we have to maintain Purex solvent qualities and to get rid of degradation products. The subject of this memoir concerns among all the degradation products the heaviest molecules. The separation and the identification of these products have been carried out by preparative steric exclusion chromatography, followed by the analysis of the samples by various analytical methods. An inactive residue containing heavy degradation products was prepared according to the process used in the UP3 La Hague plant. The Analysis of this residue using steric exclusion chromatography and GPC/MS methods, shows the presence of three families of compounds heavier than TBP: the "dimers of TBP" (provided from the addition of two molecules of TBP), the "TBP-alkanes" (the main molecule is the result of the addition of dodecane with TBP), and "the functionalized TBP" (hydroxyled TBP, nitrous TBP, nitrated TBP). Plutonium (IV) retention tests were made on the various fractions generated by steric chromatography. They showed that "the dimers of TBP" and "the functionalized TBP" families are responsible for that retention. These results confirm the good efficiency of the solvent distillation system operated in UP3 plant which allow the elimination of heavy degradation products of the solvent with the residue and then restore excellent extracting properties for the recycled solvent. (author). 35 figs., 69 refs., 15 tabs.

11631 (UCRL-JC–115273) **Pyrochemical salt scrub.** Dodson, K.E. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Johnson, G.W.; McAvoy, D.P.; Holck, D.M. Lawrence Livermore National Lab., CA (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940215–7: International symposium on actinides: processing and materials, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94007071. Source: OSTI; NTIS; GPO Dep.

A pyrochemical salt scrub process for calcium chloride based salts, that eliminates the waste generated during aqueous processing and the associated chloride corrosion problem, is being developed and tested at Lawrence Livermore. In the scrub process, calcium metal is used to reduce the actinide chlorides present in residue pyrochemical salts to a metal product, called a metal button. The metal button can be stored, converted to an oxide for storage, recycled, or further refined using aqueous processing to separate the plutonium from the americium, if plutonium recovery is required. It has been determined that a calcium titration of molten salt extraction and electrorefining residue salts can be

used to determine reaction completion and to prevent the addition of excess calcium to the process. An automated calcium feeder and associated control system have been designed and built to monitor the salt scrub process and to determine when calcium metal should be fed.

0509 Transport, Handling, and Storage

Refer also to citation(s) 11756, 11860, 12167, 12180, 12181, 12726, 12732

11632 (ANL/EA/CP–80824) **Comprehensive transportation risk assessment system based on unit-consequence factors.** Biwer, B.M.; Monette, F.A.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–24: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006829. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Environmental Restoration and Waste Management Programmatic Environmental Impact Statement requires a comprehensive transportation risk analysis of radioactive waste shipments for large shipping campaigns. Thousands of unique shipments involving truck and rail transport must be analyzed; a comprehensive risk analysis is impossible with currently available methods. Argonne National Laboratory developed a modular transportation model that can handle the demands imposed by such an analysis. The modular design of the model facilitates the simple addition/updating of transportation routes and waste inventories, as required, and reduces the overhead associated with file maintenance and quality assurance. The model incorporates unit-consequences factors generated with the RADTRAN 4 transportation risk analysis code that are combined with an easy-to-use, menu-driven interface on IBM-compatible computers running under DOS. User selection of multiple origin/destination site pairs for the shipment of multiple radioactive waste inventories is permitted from pop-up lists. Over 800 predefined routes are available among more than 30 DOE sites and waste inventories that include high-level waste, spent nuclear fuel, transuranic waste, low-level waste, low-level mixed waste, and greater-than-Class C waste.

11633 (ANL/EA/CP–80976) **Hazardous waste transportation risk assessment for the US Department of Energy Environmental Restoration and Waste Management Programmatic Environmental Impact Statement – human health endpoints.** Hartmann, H.M.; Policastro, A.J.; Lazaro, M.A. Argonne National Lab., IL (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–49: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007696. Source: OSTI; NTIS; INIS; GPO Dep.

In this presentation, a quantitative methodology for assessing the risk associated with the transportation of hazardous waste (HW) is proposed. The focus is on identifying air concentrations of HW that correspond to specific human health endpoints.

11634 (CONF-930749–74) **Moderation control in low enriched ^{235}U uranium hexafluoride packaging operations and transportation.** Dyer, R.H. (USDOE Oak Ridge Operations Office, TN (United States)); Kovac, F.M.; Pryor, W.A. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 34. annual meeting of the Institute of Nuclear Materials Management; Scottsdale, AZ (United States); 18-21 Jul 1993. Order Number DE94000370. Source: OSTI; NTIS; INIS; GPO Dep.

Moderation control is the basic parameter for ensuring nuclear criticality safety during the packaging and transport of low ^{235}U enriched uranium hexafluoride before its conversion to nuclear power reactor fuel. Moderation control has permitted the shipment of bulk quantities in large cylinders instead of in many smaller cylinders and, therefore, has resulted in economies without compromising safety. Overall safety and uranium accountability have been enhanced through the use of the moderation control. This paper discusses moderation control and the operating procedures to ensure that moderation control is maintained during packaging operations and transportation.

11635 (DOE/DP–0123T) **Assessment of plutonium storage safety issues at Department of Energy facilities.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Jan 1994. 60p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94006619. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) mission for utilization and storage of nuclear materials has recently changed as a result of the end of the "Cold War" era. Past and current plutonium storage practices largely reflect a temporary, in-process, or in-use storage condition which must now be changed to accommodate longer-term storage. This report summarizes information concerning current plutonium metal and oxide storage practices which was presented at the Office of Defense programs (DP) workshop in Albuquerque, New Mexico on May 26-27, 1993 and contained in responses to questions by DP-62 from the field organizations.

11636 (INIS-JP–018, pp. 39-46) **Burnup credit issues in transportation and storage.** Brady, M.C. (Sandia National Labs., Albuquerque, NM (United States)); Sanders, T.L.; Seager, K.D.; Lake, W.H. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Reliance on the reduced reactivity of spent fuel for criticality control during transportation and storage is referred to as burnup credit. This concept has attracted international interest and is being actively pursued in the United States in the development of a new generation of transport casks. An overview of the U.S. experience in developing a methodology to implement burnup credit in an integrated approach to transport cask design is presented in this paper. Specifically, technical issues related to the analysis, validation and implementation of burnup credit are identified and discussed. (author).

11637 (INIS-JP–018, pp. 56-63) **FAKIR: a user-friendly standard for decay heat and activity calculation of LWR fuel.** Pretesacque, P. (Compagnie Generale des Matieres Nucleaires (COGEMA), 78 - Velizy-Villacoublay (France)); Nimal, J.C.; Huynh, T.D.; Zachar, M. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The shipping casks owned by the transporters and the unloading and storage facilities are subjected by their design safety report to decay heat and activity limits. It is the responsibility of the consignor or the consignee to check the compliance of the fuel assemblies to the shipped or stored with regard to these limiting safety parameters. Considering the diversity of the parties involved in the transport and storage cycle, a standardization has become necessary. This has been achieved by the FAKIR code. The FAKIR development started in 1984 in collaboration between COGEMA, CEA-SERMA and NTL. Its main specifications were to be a user-friendly code, to use the contractual data given in the COGEMA transport and reprocessing sheet 1 as input, and to over-estimate decay heat and activity. Originally based on computerizable standards such as ANSI or USNRC, the FAKIR equations and data libraries are now based on the fully qualified PEPIN/APOLLO calculation codes. FAKIR is applicable to all patterns of irradiation histories, with burn up from 1000 MWd/TeU to 70.000 MWd/TeU and cooling times from 1 second to 100 years. (J.P.N.).

11638 (INIS-JP–018, pp. 74-80) **Optimization analysis of irradiated targets transport shielding to be used in a ^{99}Mo production plant.** Sahyun, A. (Inst. de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Sordi, G.M.A.A.; Biazini

Filho, F.L.; Romero Filho, C.R. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The aim of this paper is to optimize the shielding thickness to transport fission products from IPEN to a laboratory in charge of the separation of ^{99}Mo, which is placed at Great Sao Paulo city (ICRP Publication 55, 1989). The cooling plus the transport time is 12 hours, according to ^{99}Mo activity of 300 Ci desired after separation. In order to calculate the shielding thickness and doses with different options, codes described elsewhere have been used (ORIGENII:Isotope generation and depletion code-Matrix exponential method, 1982; ISOSHLD:Kernel integration code purpose isotope shielding analysis, 1979). (J.P.N.).

11639 (INIS-JP–018, pp. 97-104) **Experiences on domestic transportation of spent nuclear fuels in Japan.** Nagano, I. (Nuclear Fuel Transport Co., Ltd., Tokyo (Japan)); Harada, T.; Hanate, M. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This report covers following items; Outline of domestic sea transportation, Transportation process, Organization for transportation and Results of transportation. (J.P.N.).

11640 (INIS-JP–018, pp. 105-112) **Transportation of spent fuel from light water reactors.** Bernard, H. (Compagnie Generale des Matieres Nucleaires (COGEMA), 78 - Velizy-Villacoublay (France)). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The French 'Compagnie Generale des Matieres Nucleaires' - COGEMA - is involved in the whole nuclear fuel cycle about 20 years. Among the different parts of the cycle, the Transport of Radioactive Materials, acting as a link between the differents plants has a great importance. As nuclear material transportation is the only fuel cycle step to be performed on public grounds, the industrial task has to be performed with the utmost stringent safety criteria. COGEMA and associates is now operating a fully mature commercial activity, with some 300 spent fuel shipments per year from its reprocessing customer's reactors to the LA HAGUE plant, either by rail, road or sea. The paper will review the organization of COGEMA transportation business, the level of technology with an update of the casks used for spent fuel, and the operational experience, with a particular view of the maintenance policy. (author).

11641 (INIS-JP–018, pp. 113-120) **Transport of radioactive materials in the Federal Republic of Germany (FRG) since 3. October 1990: A Survey.** Alter, U. (Bundesministerium fuer Umwelt, Naturshutz und Reaktorsicherheit, Bonn (Germany)); Collin, F.W.; Fasten, C. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The paper presents a survey on the transport of radioactive materials in the FRG. For shipments of nuclear material and large sources in the FRG - and also in the former German Democratic Republic - a license from the Federal Office for Radiation Protection (the competent authority in the FRG) due to the Atomic law and Radiological Protection Requirements are necessary. (J.P.N.).

11642 (INIS-JP–018, pp. 195-200) **A radioactive waste transportation package monitoring system for normal transport and accident emergency response conditions.** Brown, G.S. (Sandia National Labs., Albuquerque, NM (United States)); Cashwell, J.W.; Apple, M.L. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper addresses spent fuel and high level waste transportation history and prospects, discusses accident histories of radioactive material transport, discusses emergency responder needs and provides a general description of the Transportation Intelligent Monitoring System (TRANSIMS) design. The key objectives of the monitoring system are twofold: (1) to facilitate effective emergency response to accidents involving a radioactive waste transportation package, while minimizing risk to the public and emergency first-response personnel, and (2) to allow remote monitoring of transportation vehicle and payload conditions to enable research into radioactive material transportation for normal and accident conditions. (J.P.N.).

11643 (INIS-JP–018, pp. 201-208) **Historical evaluation on the transport of radioactive materials in Italy.** Caporali, P. (ENEA, Rome (Italy)); Paganelli, M.; Palmieri, G.; Trivelloni, S. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The paper shows the historical evaluation carried out by Enea-Disp on the transport in Italy of radioactive materials through some years. The evaluation is based on data coming from measurements carried out during ad hoc survey on principal railway stations and airport and on information deduced from Enea-Disp data bank. In our data bank are collected all the transport documents of the shipments sent to the competent authority, in conformity with the special requirements issued by Ministry of Industry. (J.P.N.).

11644 (INIS-JP–018, pp. 211-218) **A decade of successful domestic sea transports of radioactive waste in Sweden 1982-1992.** Dybeck, P. (Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden)); Gustafsson, B. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Today the transports of radioactive waste in Sweden are done on routine basis without any negative publicity. An important contribution to this fact is probably the very good performance of the transport system and the receiving facilities. Since the start of operation of the transport system no accidents have occurred. Almost 1600 tonnes of spent fuel and 10,000 m^3 of radioactive waste have been transported. The capacity and availability of the ship and of the transport system as a whole is large enough to cover all needs for transports of radioactive material in Sweden, at least up to the turn of this century. (J.P.N.).

11645 (INIS-JP–018, pp. 219-224) **Transport of Co-60 from Argentina to abroad.** Cesario, R. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)); Pinamonti, M. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The Co-60 bearing wastes from the Embalse Nuclear Power Plant, Argentina are transported to Canada, the United States and

Mexico. Ocean transportation, terrestrial transportation, air transportation are applied, and the total activity in bulk material shipped reached 2.96×10^{17} Bq. (J.P.N.).

11646 (INIS-JP–018, pp. 244-255) **The German cask-concept for intermediate storage and final disposal of spent fuel.** Spilker, H. (Gesellschaft fuer Nuklear-Service m.b.H, Honnover (Germany)); Janberg, K.; Hueggenberg, R. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper examined the development of a new final disposal cask system for spent fuel. The POLLUX cask has to comply with international transport regulations (IAEA regulations) as well as the requirements of the German Atomic Energy law. A special programme of measurement on a POLLUX prototype cask manufactured to a scale 1 : 1 will be carried out to confirm the design data relevant to the permit required. The licensing procedure for the POLLUX final disposal cask in Germany is on the way. (J.P.N.).

11647 (INIS-JP–018, pp. 275-282) **Transportation and disposal of low-and medium level waste using fiber reinforced concrete overpacks.** Pech, R. (Sogefibre-1, 78 - Saint-Quentin-en-Yvelines (France)); Verdier, A. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

A multiple-year research effort by Cogema culminated in the development of a new process to immobilize nuclear waste in concrete overpacks reinforced with metal fibers. The fiber concrete overpacks satisfy all French safety requirements relating to waste immobilization and disposal, and have been certified by Andra, the national radioactive waste management agency. This presentation will cover the use of the fiber-reinforced concrete overpack for disposal and transportation, and will discuss their fabrication. (J.P.N.)

11648 (INIS-JP–018, pp. 296-303) **The development of an on-site container.** Glass, R.E. (Sandia National Labs., Albuquerque, NM (United States)); McAllaster, M.E.; Jones, P.L.; McKinney, A.L. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper describes the results of the development of a packaging designed for on-site transportation of chemical munitions. The criteria for the package were patterned after the requirements for Type B packagings, but were modified to take credit for the operational controls that could be applied on-site. The design phase has been completed and a contract has been placed for fabrication of 165 units. In addition to the tests completed during the design phase, a complete sequence of verification tests will be performed on the first fleet unit. This sequence will consist of: (1) a 22,700-kg load placed on the packaging for 24 hours, (2) the flat side free drop, (3) the center-of-gravity over closure joint puncture test, and (4) a 15-min all-engulfing JP-4 pool-fire test. At the completion of the test sequence, the package will be required to meet the less than $1. \times 10^{-1}$ std cc/s leak test. (J.P.N.).

11649 (INIS-JP–018, pp. 443-448) **Transport system for low level radioactive wastes in Japan.** Tanaka, K. (Nuclear Fuel Transport Co. Ltd., Tokyo (Japan)); Yoshida, K.; Sanui, T. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Nuclear Fuel Transport Co. (NFT) is to take charge of LLW transportation from each nuclear power plants to the final repository consigned by 10 electric power companies in Japan. In order to transport LLW safely and efficiently, NFT has developed and prepared various hardware, such as special packaging, an exclusive use vessel, automatic cranes and so forth together with software to use them. The procedure of transport is also described. (J.P.N.).

11650 (INIS-JP–018, pp. 449-455) **The Swedish sea transportation system for safety reasons.** Dybeck, P. (Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden)). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Sweden began to design and build a sea transportation system. The ship M/S SIGYN is specially designed for transports of radioactive waste. It is a combined roll-on/roll-off and lift-on/lift-off vessel. It is built for world wide operation and with the highest requirements of two independent classification societies, Lloyds Register of Shipping and Bureau Veritas. The ship is also designed to conform to the Swedish/Finish ice class 1A. The transport cask for spent fuel, TN 17/2, and core component TN 17-CC are designed as type (B) casks and manufactured to comply with the IAEA Regulations for the Safe Transport of Radioactive Materials, 1973. (J.P.N.).

11651 (INIS-JP–018, pp. 456-461) **Consignor's part and multimodality of the packages of RAM.** Grenier, M. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

One of the essential principles of Safety in transport of RAM as it was carried on, until the present days, is that the safety comes firstly from the packaging, and not from a special consideration of the mode of transport or anything else. A natural consequence was that the packaging remains the same, whatever is the used mode of transport, another that the transport mode does not take part, otherly than by its normal safety in the carriage itself in the protection against the radioactive hazard. Some recent actions, nevertheless, could be considered as putting some doubt on the implementation of this principles in the regulations and sometimes on these principles themselves. However, these latter come from the fact that the safety of the transport lays essentially in the hands of the consignor. He is indeed the only one who knows well enough the material and who is able to assess the adequation of the packaging and to warrant it to the Competent Authority when necessary. Besides, the packaging is the only direct grasp he has on the shipment, outside the special case of exclusive use. This situation is not completely incompatible with a new possible graduation of the packaging according to the transport mode, under the condition that this graduation be unidimensional which means the same in every field of testing. The consignor must, then, select the packaging corresponding to the most demanding of the possible modes. It is certainly much more difficult to adapt the mode of transport to the shipped materials themselves. All the transport has then to be in the hands of the consignor. That perhaps, can be relevant to industrial nuclear transport (eg: irradiated fuels, wastes), but not to the carriage of radioactive materials in general, which is the scope of IAEA regulations. (author).

11652 (INIS-JP–018, pp. 525-532) **Alternative risk-based criteria for transportation of radioactive materials on the United States Department of Energy Hanford Site.** Mercado, J.E. (Westinghouse Hanford Co., Richland, WA (United States)); Field,

J.G.; Smith, R.J.; Wang, O.S. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper presents the development of an alternative method to evaluate packaging safety for radioactive material transported solely within the boundaries of a restricted site; the method uses risk-based criteria to assess and document packaging safety. These criteria offer a standard against which the results of a risk assessment are compared to evaluate the safety of a transportation operation. Numerous payloads are transported entirely within the U.S. Department of Energy's Hanford Site boundaries. The U.S. Department of Energy requires that the safety of onsite transportation be equivalent to the safety provided for transporting radioactive materials in commerce as regulated by the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission. Some onsite packaging configurations do not meet the performance criteria that form the basis of these regulations, necessitating the establishment of alternative criteria to evaluate safety. Quantitatively defined criteria have been derived from the U.S. Department of Transportation limits for package radiation levels, curie content, activity release, and external contamination levels. Recommendations of the International Committee on Radiation Protection may further restrict the criteria. The proposed method documents packaging safety in a transportation risk assessment. The assessment estimates accident frequencies, conservatively evaluates the dose consequences of these accidents, and compares the results to the established risk acceptance criteria. Specific Hanford Site onsite packaging and transportation issues illustrate the alternative method. The paper compares the solutions resulting from the application of risk-based criteria to those resulting from strict compliance with commercial transportation regulations. (author).

11653 (NUREG–0430-Vol.13) **Licensed fuel facility status report: Inventory difference data, July 1, 1992–June 30, 1993: Volume 13.** Joy, D.R. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Material Safety and Safeguards. Feb 1994. 11p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The Nuclear Regulatory Commission is committed to an annual publication of licensed fuel facilities' inventory difference (ID) results, after Agency review of the information and completion of any related investigations. Information in this report includes ID results for active fuel fabrication and/or recovery facilities. Acronyms and/or abbreviations used in this report are identified on page vii. The various terms and acronyms used in this publication are defined on pages 1 through 4. It should be noted that UNC-Naval Products (Docket No. 70-371 and License No. SNM-368) in Montville, Connecticut, has been deleted from this report because of its inactive status.

11654 (ORNL/TM–12642) **Criticality safety study of the MSRE Fuel Drain Tank Cell in Building 7503.** Hollenbach, D.F.; Hopper, C.M. Oak Ridge National Lab., TN (United States). Jan 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007918. Source: OSTI; NTIS; GPO Dep.

Includes 1 3 1/2 in. floppy disk.

This report provides a criticality safety study of the molten salt reactor fuel currently being stored in the Fuel Drain Tank (FDT) Cell of the Molten Salt Reactor Experiment (MSRE) facility (Building 7503) located in the Melton Valley area of the Oak Ridge National Laboratory. The FDTs contain approximately 36 kg of uranium consisting primarily of ^{233}U, some plutonium, and fission products in a solidified fluoride salt mixture. The nominal composition of the fluoride salt mixture in the FDTs is 42.16 wt % LiF, 35.79 wt % BeF_2, 21.01 wt % ZrF_4, 1.02 wt % UF_4, and 0.02 wt % PuF_3. The historic criticality safety study does not meet current standards. This work is in support of a new nuclear criticality safety analysis and approval update. Questions concerning the degree of subcriticality associated with the material in its current state and in its most reactive credible upset condition are addressed. The safety study consists of two parts. In the first part, the FDT Cell was modeled using KENO V.a and analyzed using a variety of cross-section sets. The base FDT Cell model was then modified to represent the most reactive credible upset conditions and analyzed. The second part consists of establishing a benchmark for the FDT Cell. Because of the lack of any other relevant benchmark experiments, the original MSRE was also modeled in KENO V.a and analyzed. The results of the reactor model were then compared with documented MSRE reactor conditions. The analysis shows that even under the most reactive credible upset conditions, the MSRE FDT Cell is significantly subcritical.

0510 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11653, 11669

11655 (DOE/EIA–0570(92)) **Uranium purchases report 1992.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. 19 Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008252. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

Data reported by domestic nuclear utility companies in their responses to the 1991 and 1992 "Uranium Industry Annual Survey," Form EIA-858, Schedule B "Uranium Marketing Activities,are provided in response to the requirements in the Energy Policy Act 1992. Data on utility uranium purchases and imports are shown on Table 1. Utility enrichment feed deliveries and secondary market acquisitions of uranium equivalent of US DOE separative work units are shown on Table 2. Appendix A contains a listing of firms that sold uranium to US utilities during 1992 under new domestic purchase contracts. Appendix B contains a similar listing of firms that sold uranium to US utilities during 1992 under new import purchase contracts. Appendix C contains an explanation of Form EIA-858 survey methodologies with emphasis on the processing of Schedule B data.

0520 Waste Management

Refer also to citation(s) 11620, 11625, 11629, 11635, 11646, 11647, 11796, 11797, 11805, 11813, 11818, 11819, 11820, 11821, 11822, 11823, 11824, 11825, 11828, 11830, 11831, 11834, 11839, 11841, 11842, 11843, 11845, 11851, 11852, 11858, 11859, 11877, 11882, 12280, 12302, 12304, 12305, 12308, 12309, 12311, 12437, 12554, 12631, 12637, 12655, 12682, 12683, 12716, 12825, 13028, 13062, 13066, 13075, 13076, 13108, 13117, 13118, 13123, 13125, 13331, 13332, 13333, 13334, 13335, 13336, 13337, 13338, 14277

11656 (AEA-D and R–0019) **Basic user guide for the radwaste treatment plant computer system.** Keel, A. AEA Decommissioning and Radwaste, Winfrith (United Kingdom). Jul 1990. 28p. Order Number DE94616522. Source: OSTI; NTIS (US Sales Only); INIS.

This guide has been produced as an aid to using the Radwaste Treatment Plant computer system. It is designed to help new users to use the database menu system. Some of the forms can be used in ways different from those explained and more complex queries can be performed. (UK).

11657 (ANL/CHM/PP–75639) **Diphonix: A new ion exchange resin for the treatment of industrial waste streams, contaminated groundwaters, and mixed-wastes.** Horwitz, E.P. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008133. Source: OSTI; NTIS; GPO Dep.

The resin contains geminally substituted diphosphonic acid functional groups; it is synthesized by copolymerization of a tetralkylvinylidene diphosphonate with styrene, divinylbenzene, and acrylonitrile, followed by deesterifaction by refluxing with conc. HCl (the nitrile group is hydrolyzed to a carboxylic acid). The diphosphonic acid functional dominates the resin behavior toward metal ions; it has strong affinity for actinides in all oxidation states, even in 10 M HNO_3 and high salt concentrations. (Efficient agents for

stripping actinides from Diphonix all have a strong complexing agent containing the gem-diphosphonic acid functionality.) Diphonix can also remove heavy, toxi metals in high salt concentrations. 4 figs, 2 tabs.

11658 (ANL/CMT/PP–71628) **Repository relevant testing applied to the Yucca Mountain Project.** Bates, J.K.; Woodland, A.B.; Wronkiewicz, D.J.; Cunnane, J.C. Argonne National Lab., IL (United States). Oct 1990. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008476. Source: OSTI; NTIS; INIS; GPO Dep.

The tuff beds of Yucca Mountain, Nevada, are currently being investigated as a site for the disposal of high-level nuclear waste in an underground repository. If this site is found suitable, the repository would be located in the unsaturated zone above the water table, and a description of the site and the methodology of assessing the performance of the repository are described in the Site Characterization Plan (SCP). While many factors are accounted for during performance assessment, an important input parameter is the degradation behavior of the waste forms, which may be either spent fuel or reprocessed waste contained in a borosilicate glass matrix. To develop the necessary waste form degradation input, the waste package environment needs to be identified. This environment will change as the waste decays and also is a function of the repository design which has not yet been finalized. At the present time, an exact description of the waste package environment is not available. The SCP does provide an initial description of conditions that can be used to guide waste form evaluation. However, considerable uncertainty exists concerning the conditions under which waste form degradation and radionuclide release may occur after the waste package containment barriers are finally breached. The release conditions that are considered to be plausible include (1) a "bathtub" condition in which the waste becomes fully or partially submerged in water that enters the breached container and accumulates to fill the container up to the level of the breach opening, (2) a "wet drip" or "trickle through" condition in which the waste form is exposed to dripping water that enters through the top and exits the bottom of a container with multiple holes, and (3) a "dry" condition in which the waste form is exposed to a humid air environment.

11659 (ANL/EA/CP–80825) **Transportation radiological risk assessment for the programmatic environmental impact statement: An overview of methodologies, assumptions, and input parameters.** Monette, F.; Biwer, B.; LePoire, D.; Chen, S.Y. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–20: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006823. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy is considering a broad range of alternatives for the future configuration of radioactive waste management at its network of facilities. Because the transportation of radioactive waste is an integral component of the management alternatives being considered, the estimated human health risks associated with both routine and accident transportation conditions must be assessed to allow a complete appraisal of the alternatives. This paper provides an overview of the technical approach being used to assess the radiological risks from the transportation of radioactive wastes. The approach presented employs the RADTRAN 4 computer code to estimate the collective population risk during routine and accident transportation conditions. Supplemental analyses are conducted using the RISKIND computer code to address areas of specific concern to individuals or population subgroups. RISKIND is used for estimating routine doses to maximally exposed individuals and for assessing the consequences of the most severe credible transportation accidents. The transportation risk assessment is designed to ensure – through uniform and judicious selection of models, data, and assumptions – that relative comparisons of risk among the various alternatives are meaningful. This is accomplished by uniformly applying common input parameters and assumptions to each waste type for all alternatives. The approach presented can be applied to all radioactive waste types and provides a consistent and comprehensive evaluation of transportation-related risk.

11660 (ANL/EA/CP–80957) **Methodology for integrated evaluation of alternative siting and treatment, storage, and disposal strategies for U.S. Department of Energy waste management.** Avci, H.; Habegger, L.; Kotek, T. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–29: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006536. Source: OSTI; NTIS; INIS; GPO Dep.

A computational model named WASTE-MGMT has been developed by Argonne National Laboratory in support of the U.S. Department of Energy (DOE) Environmental Restoration and Waste Management (EM) Programmatic Environmental Impact Statement (PEIS) to assist in the analysis of alternative approaches to the management of existing and future radioactive wastes at DOE facilities. Input to the model includes waste inventory and characterization data at each DOE site; unit operations data for the facilities used for treatment, storage and disposal (TSD) of the wastes; and information about the alternative approaches for the TSD of the wastes and for the siting of such TSD facilities. The quantities calculated by the model include the air emissions of radionuclides and hazardous chemicals during operation of the TSD facilities, the quantities and characteristics of the wastes processes annually at these facilities, and the quantities and characteristics of the waste shipped among sites. These quantities are then used as input to calculate the cost and the environmental and socioeconomic impacts resulting from the TSD of the DOE wastes under various alternative management approaches considered in the EM PEIS.

11661 (ANL/EA/CP–80958) **Approach for systematic evaluation of transuranic waste management alternatives.** Hong, K.; Koebnick, B.; Kotek, T. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–23: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006828. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an approach for systematic evaluation of management alternatives that are being considered for the treatment, storage, and disposal of transuranic waste (TRUW) at U.S. Department of Energy sites. The approach, which is currently under development, would apply WASTE-MGMT, a database application model developed at Argonne National Laboratory, to estimate projected environmental releases and would evaluate impact measures such as health risk and costs associated with each of the waste management alternatives. The customized application would combine site-specific TRUW inventory and characterization data with treatment and transportation parameters to estimate the quantities and characteristics of the wastes to be treated, emissions of hazardous substances from the treatment facilities, and the quantities and characteristics of the wastes to be shipped between sites. These data would then be used to estimate for several TRUW management scenarios the costs and health risks of constructing and operating the required treatment facilities and of transporting TRUW for treatment and final disposal. Treatment, storage, and disposal of TRUW at DOE sites is composed of many variables and options at each stage. The approach described in this paper would provide for efficient consideration of all of these facets when evaluating potentially feasible TRUW management alternatives. By expanding existing databases, this model could eventually be adapted to accommodate the introduction of new treatment technologies, updated TRUW characterization data, and/or revised waste acceptance criteria.

11662 (ARH–263-RD) **Waste management personal notes.** Ritter, G.L. Atlantic Richfield Hanford Co., Richland, WA (United States). 19 Dec 1967. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007813. Source: OSTI; NTIS (US Sales Only); GPO Dep.

These notes report on strontium and cesium storage capabilities in B- Plant. Construction of tanks is discussed, including cost. Other aspects of waste management are recorded including neptunium-plutonium 238 separation waste, heat generation rates for fission products, and radioisotope production in Purex processing.

11663 (ARH–1943) **Interim storage of radioactive xenon and krypton gas.** Corlew, R.P. Atlantic Richfield Hanford Co., Richland, WA (United States). 14 Jan 1971. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007817. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document contains information on the planning of underwater storage of gas cylinders containing radioactive xenon and krypton gases. The 221-U Canyon Pool Cells 1,2, and 4 appear to be the most promising facilities. The proposed modifications for storing these cylinders underwater include mild steel liners, sealed steel covers, and racks to support the cylinders.

11664 (BNL–49738) **Polyethylene encapsulation of simulated blowdown waste for SEG treatability study: Letter report on Phase I screening: Waste treatment and specimen preparation.** Kalb, P.D. Brookhaven National Lab., Upton, NY (United States). 17 Aug 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94008092. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental and Waste Technology Center is a participating subcontractor in the Scientific Ecology Group (SEG) Treatability Study for Westinghouse Savannah River Co.'s Blowdown Waste. This waste will be generated at the Consolidated Incinerator Facility (CIF) and will consist of the neutralized aqueous scrubber solution from the incinerator. Since the facility is designed to burn low-level radioactive, hazardous, and mixed wastes, the blowdown waste will likely be a mixed waste. Polyethylene encapsulation is an improved treatment method that has been developed at BNL over the last 10 years. Polyethylene is an inert, thermoplastic polymer with a melt temperature of 120 C. The BNL process is a modification of standard plastics extrusion technology that has been utilized successfully by the plastics industry for over 50 years. Polyethylene binder and dry waste material are fed through separate calibrated feeders to the extruder, where the materials are thoroughly mixed, heated to a molten condition, and then extruded into a suitable mold. A monolithic solid waste form results on cooling. The objective of the Phase 1 screening effort was to prepare test specimens of CIF surrogate waste encapsulated in polyethylene for leach testing using EPA's Toxicity Characteristic Leaching Procedure (TCLP). BNL received aqueous CIF surrogate from SEG, pretreated the stimulant for processing, and fabricated TCLP test specimens for analysis at an independent laboratory. Laboratory and processing procedures are described in this letter report.

11665 (BNWL-C–119) **Management of radioactive wastes at the Hanford Plant.** Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 16 Jun 1969. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-690618–: Radioactive waste management conference, Richland, WA (United States), 23-24 Jun 1969). Order Number DE94007823. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Management of radioactive wastes at the Hanford site is presented. Radionuclide migration is also addressed.

11666 (CEA-CONF–11686) **Study on behaviour in long term of vitrified materials.** Vernaz, E. CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets. 1993. 33p. (In French). (CONF-9310301–: Pollutec: Study on behaviour in long term of vitrified materials, Paris (France), 14 Oct 1993). Order Number DE94618244. Source: OSTI; NTIS (US Sales Only); INIS.

In collaboration with EDF (Electricite de France), after testing fusion of Refiom (Residus d'Epuration des Fumees d'Incineration d'Ordures Menageres), residues from purification of incineration smokes of household rubbish, realised at Porcheville and at the Laboratory of Renardieres with experimental processing of vitrification by plasma, CEA (Centre d'Etudes Atomiques), atomic center of research, began study on resistance in long term of vitrified products. From about thirty five years, CEA carries out research to confine radioactive waste of high activity in stable materials. Glass was the first best one which allowed to incorporate about thirty different chemical elements found in fission products solutions into a stable die with a good chemical durability; three vitrification shops raised, one at Marcoule ('AVM', 1978) in the south of France, the two other ones at La Hague ('R7', 1989 and 'T7', 1992) in Normandy. To determine a possible impact of a deep radioactive waste disposal on human and environment, several studies began. In particular, studies on aqueous corrosion of glasses to determine behaviour in long term of glass package (first barrier of confinement) and to estimate kinetics of releasing confined toxical elements on periods of several thousands years. Principal results are exposed in this conference. Experience shows that safety analysis cannot be based on long term extrapolation of a simple lixiviation result. This analysis must include: a sufficient knowledge in basic mechanisms of alteration to predict the kinetic evolution in a long term. To take in account environment conditions with a normal or accidental scheme (acidity, clay, organic compounds,...). This knowledge broadly developed by CEA for nuclear glasses seems to be easily transposable to different wastes (industrial ones or from hospitals) and takes place in a contract of research CEA/EDF to valorize vitrified products. 9 figs. 4 refs.

11667 (CONF-930205–82) **Carbon-14 releases from an unsaturated repository: A senseless but expensive dilemma.** Pflum, C.G. Science Applications International Corp., Las Vegas, NV (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-87NV10576. From Waste management '93; Tucson, AZ (United States); 28 Feb - 4 mar 1993. Order Number DE94000976. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the US Environmental Protection Agency (EPA) Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR Part 191 or standards) is to protect public health and safety. The 1985 rule was developed on the basis of the assumption that the repository would be located in a geologic formation that lies below the water table. It is appropriate to examine gaseous releases and transport of pollutants in order to determine site adequacy. When the provisions of the 1985 standard are applied to Yucca Mountain, specifically the limits for carbon-14, we can release in 10,000 years no more than 7,000 curies of carbon-14 in the form of carbon dioxide. Meanwhile, the US Department of Energy (DOE) and others indicate that the repository may release about 8,000 curies of carbon-14 dioxide, an amount that exceeds the standard by 10 to 20 percent. The original basis of the 1985 standards was that, in a site below the water table, the limit for carbon-14 was technically achievable. It was not a standard based on a release level that would prevent a danger to public health. If we examine the danger to public health of the release of 8,000 curies of carbon-14 dioxide during and 8,000-year period, this release would not a pose a significant threat to the average individual. Industry and natural sources release many times this amount of carbon-14 dioxide each year. The question therefore becomes: is it appropriate to spend an additional $3.2 billion on waste packages when the expenditure does not measurably improve the public health?

11668 (CONF-940553–2) **Negotiating equity for management of DOE wastes.** Carnes, S.A. Oak Ridge National Lab., TN (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994. Order Number DE94002789. Source: OSTI; NTIS; INIS; GPO Dep.

One important factor frustrating optimal management of DOE-complex wastes is inability to use licensed and permitted facilities systematically. Achieving the goal of optimal use of DOE's waste management facilities is politically problematic for two reasons. First, no locale wants to bear a disproportionate burden from DOE wastes. Second, the burden imposed by additional wastes transported from one site to another is difficult to characterize. To develop a viable framework for equitably distributing these burdens while achieving efficient use of all DOE waste management facilities, several implementation and equity issues must be addressed and resolved. This paper discusses stakeholders and equity issues and proposes a framework for joint research and action that could facilitate equity negotiations among stakeholders and move toward a more optimal use of DOE's waste management capabilities.

11669 (CONF-940553–3) **Toward integrated design of waste management technologies.** Carnes, S.A.; Wolfe, A.K. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994. Order Number DE94002790. Source: OSTI; NTIS; GPO Dep.

What technical, economic and institutional factors make radioactive and/or hazardous waste management technologies publicly acceptable? The goal of this paper is to initiate an identification of factors likely to render radioactive and hazardous waste management technologies publicly acceptable and to provide guidance on how technological R&D might be revised to enhance the acceptability of alternative waste management technologies. Technology development must attend to the full range of technology characteristics (technical, engineering, physical, economic, health, environmental, and socio-institutional) relevant to diverse stakeholders. ORNL's efforts in recent years illustrate some attempts to accomplish these objectives or, at least, to build bridges toward the integrated design of waste management technologies.

11670 (CPD–220-Add.) **Hanford radioactive waste management plans.** Elgert, O.J.; Kuhlman, C.W.; Voiland, E.E.; Warren, J.H. (comps.). USAEC Waste Management Advisory Board, Richland, WA (United States). 15 Jan 1969. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007872. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This addendum provides primarily the information relative to waste management as called out in the unclassified report. This information is provided in the following tables. In addition to the gaseous radionuclides (Ar-41, I-131, H-3) noted in the unclassified report, krypton and xenon are also released during dissolution of fuel. The chemically inert character of these elements prevents their removal by the usual off-gas treatment, but at the same time also prevents their uptake by biological species. Thus, these radionuclide contribution to personnel dose is only through direct exposure to stack effluent. Dilution by the atmosphere effectively reduces the concentrations of all these gases so that they are undetectable beyond the reservation boundaries. Radioactive krypton and xenon contribute essentially nothing to radiation dose off-site and very little on-site.

11671 (DOE/AL/58309–54) **Preoperational radiation surveillance of the WIPP project by EEG during 1992.** Kenney, J.W. Environmental Evaluation Group, Albuquerque, NM (United States). Feb 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG–54). Order Number DE94007446. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the EEG preoperational monitoring program is to document the existing concentrations of selected radionuclides in various environmental media collected from the vicinity of the WIPP site to provide a basis of comparison of any effects of future WT-PP operations. The basic methodology for conducting environmental surveillance both on-site and off-site was outlined by Spiegler (1984). This report represents a continuation of the EEG baseline data beginning in 1985, previously reported in EEG-43, EEG-47, EEG-49 and EEG-51. Such radionuclide baseline data are important in order to determine whether future WIPP operations with radioactive waste have affected concentrations of these radionuclides in the environment. EEG data are consistent with similar environmental measurements obtained by DOE beginning in 1985. Since late 1985, the EEG has collected or received as split samples 2 443 air filters with particulates, 202 water samples, 16 biota samples and 13 soil/sediment samples. A total of 5,946 specific radionuclide analyses have been performed on these samples. As reported previously by EEG (EEG-43, EEG-47, EEG-49 and EEG-51), observed concentrations of U-238 daughter radionuclides were not in equilibrium with the parent radionuclide in water samples. This observation is consistent with different radionuclide mobility in the environment. In a notice of proposed rule making for 40 CFR 141 (US EPA 1991), the Environmental Protection Agency (EPA) National Primary Drinking Water Regulations reflect this in the calculated activity-to-mass ratio of 1.3 pCi/μg of uranium using a geometric mean of the U-234:U-238 ratio in water supplies of 2.7. Ra-226 and Ra- 228 were reported in a number of water samples in concentrations similar to those previously published by EEG and DOE.

11672 (DOE/AL/62350–100) **In situ testing to determination field-saturated hydraulic conductivity of UMTRA Project disposal cell covers, liners, and foundation areas: Special study.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007199. Source: OSTI; NTIS; INIS; GPO Dep.

This special study was conducted to prepare a guidance document for selecting in situ hydraulic conductivity (K) tests, comparing in situ testing methods, and evaluating the results of such tests. This report may be used as a practical decision-making tool by the Uranium Mill Tailings Remedial Action (UMTRA) Project staff to determine which testing method will most efficiently achieve the field-saturated K results needed for long-term planning. A detailed section on near-surface test methods discusses each method which may be applicable to characterization of UMTRA disposal cell covers, liners and foundation materials. These potentially applicable test methods include the sealed double-ring infiltrometer (SDRI), the air-entry permeameter (AEP), the guelph permeameter, the two-stage borehole technique (TSB), the pressure infiltrometer, and the disk permeameter. Analytical solutions for these methods are provided, and limitations of these solutions are discussed, and a description of testing equipment design and installation are provided.

11673 (DOE/EH–231-021/0993) **Delay of closure for RCRA hazardous waste management facilities: RCRA Information Brief.** Coalgate, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Sep 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008205. Source: OSTI; NTIS; GPO Dep.

Owners/operators of hazardous and radioactive mixed waste (RMW) management facilities must perform closure in accordance with applicable closure regulations and facility-specific closure plans. The closure regulations impose deadlines for the notification of closure; for the treatment, removal, or on-site disposal of waste; and for the completion of partial and final closure. On August 14, 1989 Environmental Protection Agency published final regulations allowing hazardous waste landfill, surface impoundment, and land treatment units meeting the criteria described below to delay closure to receive non-hazardous waste [54 FR 33376 et seq., August 14, 1989]. Prior to the promulgation of these requirements, all owners/operators were required to complete closure activities within 90 days of receiving the final volume of hazardous waste, unless they were granted an extension. Owners/operators delaying closure to accept non-hazardous waste are still required to operate under applicable hazardous waste treatment, storage, and disposal facility (TSDF) regulations for permitted (40 CFR 264) or interim status (40 CFR 265) facilities. This information Brief describes the circumstances under which owners/operators of hazardous waste management facilities may delay closure to receive non-hazardous waste after the receipt of the final volume of hazardous waste. The revised Federal standards are applicable in states that are not authorized to carry out the RCRA program. States that are authorized to carry out the RCRA program may adopt equivalent regulations under State law. However, because these standards reduce the scope of the existing Federal requirements, authorized states are not required to adopt equivalent regulations [54 FR 33393, August 14, 1989].

11674 (DOE/EH–231-026/0593) **Requirements for satellite accumulation areas: RCRA Information Brief.** Powers, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jul 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008207. Source: OSTI; NTIS; GPO Dep.

In 1980, EPA promulgated hazardous waste management regulations under the Resource Conservation and Recovery Act (RCRA), which included standard for generators of hazardous

waste. With respect to storage of hazardous waste on-site by generators, these regulations originally made no distinction between the initial accumulation of hazardous waste at various points of generation (i.e., "satellite" accumulation) and storage at locations where hazardous waste is consolidated for on-site management or transportation off-site. EPA amended the hazardous waste generator regulations on December 20, 1984, to allow generators to store hazardous waste in satellite areas as long as certain conditions were met. State programs, however, do not have to allow for the accumulation of hazardous waste in satellite areas or may have more stringent requirements for these waste accumulation areas. A satellite accumulation area is a storage location at or near any point of generation where hazardous wastes initially accumulate, which is under the control of the operator of the process generating the waste. Wastes stored in these areas are subject to regulatory requirements that are less stringent than requirements applicable to hazardous wastes stored in permitted, interim status, or 90-day storage areas meeting the applicable provisions of 40 CFR 264, 265, or 262.34(a), respectively.

11675 (DOE/EH–231-033/0793) **Inspections of RCRA container storage areas.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. Jul 1993. 3p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008193. Source: OSTI; NTIS; GPO Dep.

Thorough and regular inspection of RCRA hazardous and raidoactive mixed waste containers and container storage areas at DOE facilities is critical to ensure proper operating practices; promote worker safety; prevent leaks, spills, and other releases; and protect human heath and the environment. To properly carry out their inspection responsibilities, owners/operators must be able to recognize unsafe conditions and environmental hazards and must also adhere to formal inspection procedures, Including preparing schedules and keeping detailed records.

11676 (DOE/EM–0139P) **Technical review of Molten Salt Oxidation.** USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Dec 1993. 154p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007838. Source: OSTI; NTIS; INIS; GPO Dep.

The process was reviewed for destruction of mixed low-level radioactive waste. Results: extensive development work and scaleup has been documented on coal gasification and hazardous waste which forms a strong experience base for this MSO process; it is clearly applicable to DOE wastes such as organic liquids and low-ash wastes. It also has potential for processing difficult-to-treat wastes such as nuclear grade graphite and TBP, and it may be suitable for other problem waste streams such as sodium metal. MSO operating systems may be constructed in relatively small units for small quantity generators. Public perceptions could be favorable if acceptable performance data are presented fairly; MSO will likely require compliance with regulations for incineration. Use of MSO for offgas treatment may be complicated by salt carryover. Figs, tabs, refs.

11677 (DOE/EM–94007053) **Site maps and facilities listings.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Nov 1993. 227p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007053. Source: OSTI; NTIS; INIS; GPO Dep.

In September 1989, a Memorandum of Agreement among DOE offices regarding the environmental management of DOE facilities was signed by appropriate Assistant Secretaries and Directors. This Memorandum of Agreement established the criteria for EM line responsibility. It stated that EM would be responsible for all DOE facilities, operations, or sites (1) that have been assigned to DOE for environmental restoration and serve or will serve no future production need; (2) that are used for the storage, treatment, or disposal of hazardous, radioactive, and mixed hazardous waste materials that have been properly characterized, packaged, and labelled, but are not used for production; (3) that have been formally transferred to EM by another DOE office for the purpose of environmental restoration and the eventual return to service as a DOE production facility; or (4) that are used exclusively for long-term storage of DOE waste material and are not actively used for production, with the exception of facilities, operations, or sites under the direction of the DOE Office of Civilian Radioactive Waste Management. As part of the implementation of the Memorandum of Agreement, Field Offices within DOE submitted their listings of facilities, systems, operation, and sites for which EM would have line responsibility. It is intended that EM facility listings will be revised on a yearly basis so that managers at all levels will have a valid reference for the planning, programming, budgeting and execution of EM activities.

11678 (DOE/EM–94007925) **US Department of Energy's Federal Facility Compliance Act Chief Financial Officer's Report to Congress for fiscal year 1993.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Dec 1993. 135p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007925. Source: OSTI; NTIS; GPO Dep.

The Federal Facility Compliance Act of 1992 (FFCAct) (Public Law 102-386) was enacted into law on October 6, 1992. In addition to amending the Resource Conservation and Recovery Act (RCRA), the FFCAct requires the US Department of Energy (DOE) to prepare an annual report from the Chief Financial Officer to the Congress on compliance activities undertaken by the DOE with regard to mixed waste streams and provide an accounting of the fines and penalties imposed upon the DOE for violations involving mixed waste. This document has been prepared to report the necessary information. Mixed waste is defined by the FFCAct to include those wastes containing both hazardous waste as defined in the RCRA and source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954, as amended (42 U.S.C. Section 2001 et seq.). Section 2 of this report briefly summarizes DOE Headquarters' activities conducted during Fiscal Year 1993 (FY 1993) to comply with the requirements of the FFCAct. Section 3 of this report provides an overview of the site-specific RCRA compliance activities, relating to mixed waste streams, conducted in FY 1993 for those sites that currently generated or store mixed waste that are subject to regulation under RCRA. Section 4 provides information on notifications of alleged RCRA violations involving mixed waste imposed upon the DOE during FY 1993 and an accounting of any fines and penalties associated with these violations. Appendix A provides site-specific summaries of RCRA compliance activities, relating to mixed waste streams, conducted in FY 1993 for those sites that currently generate or store mixed waste that are subject to regulation under RCRA.

11679 (DOE-HMIP-RR–93.033) **Software quality assurance and information management, October 1986 to October 1992: Final report.** Hill, I.E. Cedar Design Systems Ltd., London (United Kingdom). 1993. 20p. Sponsored by Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Contract PECD-7/9/384. (CDS-MR–19.). Order Number DE94616528. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the work carried out by Cedar Design Systems Limited under contract PECD 7/9/384. The brief for the contract was initially to provide advice on Software Quality Assurance (SQA) as part of the CEC PACOMA project. This was later extended to include further SQA and information management tasks specific to the HMIP Radioactive Waste Disposal Assessments Research Programme. (Author).

11680 (DOE-HMIP-RR–93/047) **Review of disposal techniques for radioactively contaminated organic ion-exchange resins.** Inman, J.R. (Electrowatt Engineering Services Ltd., London (United Kingdom)); Mack, J. Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Mar 1993. 164p. Contract EWE-2893. (PECD–7/9/610.). Order Number DE94618263. Source: OSTI; NTIS (US Sales Only); INIS.

Organic ion-exchange resins are used in the UK nuclear industry to remove radioactive nuclides from dilute aqueous solution. Resins represent a significant proportion of the organic content of ILW and LLW, particularly ILW. Spent resins are destined to be disposed of in the UK deep repository. There are concerns regarding the potential effects of organic materials on long-term repository performance, and these effects have been the subject of much recent research work. The object of this study has been to conduct a

worldwide review of treatment and conditioning techniques available for spent organic ion-exchange resins with the intention of recommending the best option for dealing with the waste in the UK. Data on available techniques have been gathered together, and are presented in tabular form at the back of the report. The techniques have been reviewed and compared considering safety, practicality and cost, and a best option selected on the basis of current knowledge. On balance it would appear that wet oxidation using hydrogen peroxide with residue encapsulation in BFS/OPC is the most appropriate technique, probably implemented using a mobile plant. This conclusion and recommendation is not however clear cut and further advice regarding the acceptability of organic material in the repository is necessary before a definite recommendation can be made. (Author).

11681 (DOE/LLW–193) **Material Not Categorized As Waste (MNCAW) data report: Radioactive Waste Technical Support Program.** Casey, C.; Heath, B.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1992. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008513. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE), Headquarters, requested all DOE sites storing valuable materials to complete a questionnaire about each material that, if discarded, could be liable to regulation. The Radioactive Waste Technical Support Program entered completed questionnaires into a database and analyzed them for quantities and type of materials stored. This report discusses the data that TSP gathered. The report also discusses problems revealed by the questionnaires and future uses of the data. Appendices contain selected data about material reported.

11682 (DOE/NV/10845–23) **Summary of wells validated during fiscal years 1991 to 1992.** Lyles, B.F. Nevada Univ., Reno, NV (United States). Water Resources Center. Jun 1993. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE94007204. Source: OSTI; NTIS; GPO Dep.

The Well Validation Project was initiated in fiscal year 1990, with the intended purpose to evaluate wells on the Nevada Test Site. During fiscal years 1991 and 1992, a temperature/electrical conductivity logging tool was redesigned and a thermal-pulse flowmeter logging tool was developed. Seven wells were evaluated during this time period: USGS HTH #1, UE-18r, UE-14b, HTH "E", USGS Test Well B Ex., UE-1q, and UE-5n. The validation techniques used at each site varied depending on the site-specific objectives. Thermal-pulse flowmeter surveys were carried out in several of the wells with limited success. The thermal-pulse flowmeter was designed for boreholes 2 to 6 inches in diameter, most wells at the Nevada Test Site are generally much larger in diameter, 10 to 24 inches. Therefore, the thermal-pulse flowmeter was outfitted with an inflatable rubber packer, which constricts borehole flow through the thermal-pulse flowmeter, increasing the resolution. The thermal-pulse flowmeter can be outfitted with various-sized packers depending on the borehole diameter to be evaluated; these packers are commercially available. The packers are inflated with borehole fluid via a small submersible pump which was designed, built, and tested as part of this study.

11683 (DOE/NV/10872–T85) **DOE Waste Package Project: Quarterly progress report, October 1, 1993–December 31, 1993.** Ladkany, S.G. Nevada Univ., Las Vegas, NV (United States). Dept. of Civil and Environmental Engineering. [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94007769. Source: OSTI; NTIS; GPO Dep.

The Waste Package Project research activities continued in all research areas. The areas include: Container structural and stress analysis; Nuclear fission criticality studies; Investigation of canister design concepts and corrosion studies; Heat transfer studies; Fluid flow in porous media and radionuclide transport in near field rock; Studies of stresses and stability of the rock formations resulting from the thermal loading of the fuel elements and the multi tunnel concept being analyzed; Characterization of a Faulted Rock Tunnel Model Using Photoelastic and Finite Element Studies; Experiment studies of the dynamic response of a flexible three-link robot using strain gages and Lagrange polynomials; and Robotic manipulation of the nuclear waste container.

11684 (DOE/NV/10872–T91) **Identification and characterization of conservative organic tracers for use as hydrologic tracers for the Yucca Mountain site characterization project: Quality Assurance Project Plan, Revision 1: Quarterly progress report, October 1, 1993–December 31, 1993.** Stetzenbach, K.J. Nevada Univ., Las Vegas, NV (United States). Harry Reid Center for Environmental Studies. 13 Dec 1993. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94007777. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this work is to identify and characterize candidate conservative organic tracers for use as hydrologic tracers for experiments to be conducted at the Yucca Mountain C-well complex. During this quarter the main effort was directed towards rewriting the quality assurance program in preparation for a review and audit by the USGS. However, due to budget constraints the review and audit were not carried out. The tracer QA plan and standard operating procedures (SOPs) were revised and copies are included in the report. Instrumental problems were encountered and corrected with the addition of new integration and sample control software. In the sampling, there was an unexplained peak in the chromatograms of the tracers being tested in the light tuff. This was not correctable and these experiments will be repeated in the next quarter.

11685 (DOE/NV/10872–T98) **Heat transfer studies of waste repository design: Progress report, [October 1, 1993–December 31, 1993].** Boehm, R.F. Nevada Univ., Las Vegas, NV (United States). 20 Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94007784. Source: OSTI; NTIS; GPO Dep.

A study of the phase change phenomena in porous media using Christiansen filters continues in order to determine the experimental conditions most favorable to the use of this method. A calibration setup has been finished. Determination of the wavelength corresponding to the equality of the refractive indices varies with temperature is going to be carried out later. The dispersion curves of the solid and liquid phases constituting a transparent saturated porous medium generally have different slopes. It is thus impossible to achieve the equality of the refractive indices for all wavelengths simultaneously. For a given temperature, the dispersion curves intersect at a point corresponding to a single wavelength. From our investigation, we have found that we need to change the liquid phase material, ethyl salicylate ($HOC_6H_4COOC_2H_5$), that we have proposed before. This is because the boiling point of ethyl salicylate is too high for our purposes (about 233°C). Therefore, it is not a suitable material to do the phase change study in the Christiansen filters. A suitable liquid phase organic chemical material for our research must fit the criteria given in this paper.

11686 (DOE/NV/11432–40) **Hydrogeologic data for existing excavations and the Area 5 Radioactive Waste Management Site, Nevada Test Site, Nye County, Nevada.** Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Dec 1993. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE94008268. Source: OSTI; NTIS; INIS; GPO Dep.

The Special Projects Section of Reynolds Electrical & Engineering Co., Inc. is responsible for characterizing the subsurface geology and hydrology of the Area 5 Radioactive Waste Management Site (RWMS) at the Nevada Test Site (NTS) for the US Department of Energy, Nevada Operations Office (DOE/NV), Office of Environmental Restoration and Waste Management Waste Management Division. Geologic description, in situ testing, and laboratory analyses of alluvium exposed in existing excavations are important subparts to the Area 5 Site Characterization Program designed to determine the suitability of the RWMS for disposal of low level waste mixed waste and transuranic waste. The primary purpose of the Existing Excavation Project is two-fold: first, to characterize important hydrologic properties of the near surface alluvium, thought to play an important role in the infiltration and redistribution of water and solutes through the upper unsaturated zone at the Area 5 RWMS; and second, to provide guidance for

the design of future sampling and testing programs. The justification for this work comes from the state of Nevada review of the original DOE/NV Part B Permit application submitted in 1988 for disposal of mixed wastes at the RWMS. The state of Nevada determined that the permit was deficient in characterization data concerning the hydrogeology of the unsaturated zone. DOE/NV agreed with the state and proposed the study of alluvium exposed in existing excavations as one step toward satisfying these important site characterization data requirements. Other components of the site characterization process include the Science Trench Borehole and Pilot Well Projects.

11687 (DOE/OR–01-1192-D1) **Environmental Monitoring Plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Sep 1993. 184p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–158-D1). Order Number DE94007244. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the Environmental Monitoring Plan (EMP) for Waste Area Grouping (WAG) 6 at the Oak Ridge National Laboratory (ORNL). Based on the results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and on subsequent discussions with regulators, a decision was made to defer implementing source control remedial measures at the WAG. The alternative selected to address the risks associated with WAG 6 involves maintenance of site access controls prevent public exposure to on-site contaminants, continued monitoring of contaminant releases determine if source control measures are required, and development of technologies that could support the final remediation of WAG 6. Although active source control measures are not being implemented at WAG 6, environmental monitoring is necessary to ensure that any potential changes in contaminant release from the WAG are identified early enough to take appropriate action. Two types of environmental monitoring will be conducted: baseline monitoring and annual routine monitoring. The baseline monitoring will be conducted to establish the baseline contaminant release conditions at the WAG, confirm the site-related chemicals of concern (COCs), and gather data to confirm the site hydrologic model. The baseline monitoring is expected to begin in 1994 and last for 12–18 months. The annual routine monitoring will consist of continued sampling and analyses of COCs to determine off-WAG contaminant flux and risk, identify mills in releases, and confirm the primary contributors to risk. The annual routine monitoring will continue for ~ 4 years after completion of the baseline monitoring.

11688 (DOE/RL–90-04-Rev.2) **303-K Storage Facility closure plan: Revision 2.** USDOE Richland Operations Office, WA (United States). 15 Dec 1993. 263p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007423. Source: OSTI; NTIS; INIS; GPO Dep.

Recyclable scrap uranium with zircaloy-2 and copper silicon alloy, uranium-titanium alloy, beryllium/zircaloy-2 alloy, and zircaloy-2 chips and fines were secured in concrete billets (7.5-gallon containers) in the 303-K Storage Facility, located in the 300 Area. The beryllium/zircaloy-2 alloy and zircaloy-2 chips and fines are designated as mixed waste with the characteristic of ignitability. The concretion process reduced the ignitability of the fines and chips for safe storage and shipment. This process has been discontinued and the 303-K Storage Facility is now undergoing closure as defined in the Resource Conservation and Recovery Act (RCRA) of 1976 and the Washington Administrative Code (WAC) Dangerous Waste Regulations, WAC 173-303-040. This closure plan presents a description of the 303-K Storage Facility, the history of materials and waste managed, and the procedures that will be followed to close the 303-K Storage Facility. The 303-K Storage Facility is located within the 300-FF-3 (source) and 300-FF-5 (groundwater) operable units, as designated in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1992). Contamination in the operable units 300-FF-3 and 300-FF-5 is scheduled to be addressed through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 remedial action process. Therefore, all soil remedial action at the 304 Facility will be conducted as part of the CERCLA remedial action of operable units 300-FF-3 and 300-FF-5.

11689 (DOE/RL–93-76) **Hanford Federal Facility state of Washington leased land.** USDOE Richland Operations Office, WA (United States). Nov 1993. 531p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007991. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared to provide information concerning past solid and hazardous waste management practices for all leased land at the US DOE Hanford Reservation. This report contains sections including land description; land usage; ground water, air and soil monitoring data; and land uses after 1963. Numerous appendices are included which provide documentation of lease agreements and amendments, environmental assessments, and site surveys.

11690 (DOE/RL–93-94) **Plan and schedule for disposition and regulatory compliance for all remaining Miscellaneous Streams.** Skurla, S.J. USDOE Richland Operations Office, WA (United States). Jan 1994. 23p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94006997. Source: OSTI; NTIS; INIS; GPO Dep.

On December 23, 1991, the US Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology) agreed to adhere to the provisions of Department of Ecology Consent Order No. DE 91NM-177 (Consent Order) (Ecology and USDOE, 1991). The Consent Order lists regulatory milestones for liquid effluent streams at the Hanford Site to comply with the permitting requirements of Washington Administrative Code 173-216 or 173-218 where applicable (WAC 173-216/218). Hanford Site liquid effluent stream discharging to the soil column have been categorized in the Consent Order as follows: Phase I Streams; Phase II Streams; Miscellaneous Streams. Phase I and Phase II Streams are identified in two RL reports: "Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site" (DOE-RL 1987), and "Annual Status of the Report of the Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site" (Stordeur 1988). Miscellaneous Streams are those liquid effluent streams discharged to the ground that are not categorized as Phase I or Phase II Streams. Miscellaneous Streams discharging to the soil column at the Hanford Site are subject to the requirements of several milestones identified in the Consent Order. This document provides a plan and schedule for the disposition of Miscellaneous Streams to satisfy one of the Miscellaneous Stream Consent Order requirements. The disposition process for the Miscellaneous Streams as developed for this milestone is facilitated using a decision tree format. The logic diagram and corresponding analysis for determining appropriate disposition of these streams is presented in this document.

11691 (DOE/RL–93-104) **Decontamination and decommissioning assessment for the Waste Incineration Facility (Building 232-Z) Hanford Site, [Hanford], WA.** Dean, L.N. (Advanced Sciences, Inc., (United States)). USDOE Richland Operations Office, WA (United States). Feb 1994. 108p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007983. Source: OSTI; NTIS; INIS; GPO Dep.

Building 232-Z is an element of the Plutonium Finishing Plant (PFP) located in the 200 West Area of the Hanford Site. From 1961 until 1972, plutonium-bearing combustible materials were incinerated in the building. Between 1972 and 1983, following shutdown of the incinerator, the facility was used for waste segregation activities. The facility was placed in retired inactive status in 1984 and classified as a Limited Control Facility pursuant to DOE Order 5480.5, Safety of Nuclear Facilities, and 6430.1A, General Design Criteria. The current plutonium inventory within the building is estimated to be approximately 848 grams, the majority of which is retained within the process hood ventilation system. As a contaminated retired facility, Building 232-Z is included in the DOE Surplus Facility Management Program. The objective of this Decontamination and Decommissioning (D&D) assessment is to remove Building 232-Z, thereby elmininating the radiological and environmental hazards associated with the plutonium inventory within the structure. The steps to accomplish the plan objectives are: (1)

identifying the locations of the most significant amounts of plutonium, (2) removing residual plutonium, (3) removing and decontaminating remaining building equipment, (4) dismantling the remaining structure, and (5) closing out the project.

11692 (DOE/RW/00134–T8) **Yucca Mountain Site Characterization Project Technical Data Catalog (Quarterly supplement).** TRW, Inc., Fairfax, VA (United States). 31 Dec 1993. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134. Order Number DE94008425. Source: OSTI; NTIS; GPO Dep.

The March 21, 1993, Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) Site-Specific Procedural Agreement for Geologic Repository Site Investigation and Characterization Program requires the DOE to develop and maintain a catalog of data which will be updated and provided to the NRC at least quarterly. This catalog is to include a description of the data; the time (date), place, and method of acquisition; and where it may be examined. The Yucca Mountain Site Characterization Project (YMP) Technical Data Catalog is published and distributed in accordance with the requirements of the Site-Specific Agreement. The YMP Technical Data Catalog is a report based on reference information contained in the YMP Automated Technical Data Tracking System (ATDT). The reference information is provided by Participants for data acquired or developed in support of the YMP. The Technical Data Catalog is updated quarterly and published in the month following the end of each quarter. A complete revision to the Catalog is published at the end of each fiscal year. Supplements to the end-of-year edition are published each quarter. These supplements provide information related to new data items not included in previous quarterly updates and data items affected by changes to previously published reference information. The Technical Data Catalog, dated September 30, 1993, should be retained as the baseline document for the supplements until the end-of-year revision is published and distributed in October 1994.

11693 (DOE/UMTRA–3050-93-1235-Vol.1) **Uranium Mill Tailings Remedial Action Project Annual Environmental Monitoring Report calendar year 1992: Volume 1.** MK-Ferguson Co., Albuquerque, NM (United States); Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Chem Waste Management (CWM) Federal Environmental Services, Inc. (United States). [1993]. 452p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007205. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes environmental monitoring and compliance at eight UMTRA sites where remedial action was underway during 1992 and at the ten sites that were complete at the end of 1992. Volume I contains information for Ambrosia Lake, NM; Cannonsburg/Burrell, PA; Durango, CO; Falls City, TX; Grand Junction, CO; Green River, UT; and Gunnison, CO. Each site report contains a site description, compliance summary, environmental program information, environmental radiological and non-radiological program information, water resources protection, and quality assurance information.

11694 (DOE/UMTRA–3050-93-1235-Vol.2) **Uranium Mill Tailings Remedial Action Project Annual Environmental Monitoring Report calendar year 1992: Volume 2.** MK-Ferguson Co., Albuquerque, NM (United States); Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Chem Waste Management (CWM) Federal Environmental Services, Inc. (United States). [1993]. 414p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007206. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains environmental monitoring information for the following UMTRA sites for the 1992 Calendar Year: Lakeview, OR; Lowman, ID; Mexican Hat, UT; Monument Valley, AZ; Rifle, CO; Riverton, WY; Shiprock, NM; Spook, WY; Tuba City, AZ. Each site report contains a site description, compliance summary, environmental program information, environmental radiological and non-radiological program information, water resources protection, and quality assurance information.

11695 (DOE/WIPP–93-017) **Waste Isolation Pilot Plant annual site environmental report for calendar year 1992.** USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office. [1993]. 150p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007447. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) Operational Environmental Monitoring Plan (OEMP) defined a comprehensive set of parameters which are monitored to detect potential environmental impacts and establish baselines for future environmental evaluations. Surface water and groundwater, air, soil, and biotics are monitored for radioactivity levels. Nonradiological environmental monitoring activities include air, water quality, soil properties, meteorological measurements and determination of the status of the local biological community. Ecological studies focus on the immediate area surrounding the WIPP site with emphasis on the salt storage pile. The baseline radiological surveillance covers a broader geographic area including nearby ranches, villages, and cities. Since the WIPP is still in its preoperational phase (i.e., no waste has been received) certain operational requirements of DOE Orders 5400.1, 5400.5, and the Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance (DOE/EH-0173T) are not relevant. Therefore, this report does not discuss items such as radionuclide emissions and effluents and subsequent doses to the public.

11696 (DOE/WIPP–94-008) **Experimental program plan for the Waste Isolation Pilot Plant.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Jan 1994. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94007975. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has prepared this Experimental Program Plan for the Waste Isolation Pilot Plant (EPP) to provide a summary of the DOE experimental efforts needed for the performance assessment process for the WIPP, and of the linkages of this process to the appropriate regulations. The Plan encompasses a program of analyses of the performance of the planned repository based on scientific studies, including tests with transuranic waste at laboratory sites, directed at evaluating compliance with the principal regulations governing the WIPP. The Plan begins with background information on the WIPP project, the requirements of the LWA (Land Withdrawal Act), and its objective and scope. It then presents an overview of the regulatory requirements and the compliance approach. Next are comprehensive discussions of plans for compliance with disposal regulations, followed by the SWDA (Solid Waste Disposal Act) and descriptions of activity programs designed to provide information needed for determining compliance. Descriptions and justifications of all currently planned studies designed to support regulatory compliance activities are also included.

11697 (DOE/WIPP–94-009) **Carlsbad Area Office Waste Isolation Division Transition Plan.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Jan 1994. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94008042. Source: OSTI; NTIS; INIS; GPO Dep.

In October 1993, the US Department of Energy (DOE) announced the Revised Test Strategy for the Waste Isolation Pilot Plant (WIPP). The new strategy involves conducting additional radioactive waste tests in laboratories instead of the underground at the WIPP. It will likely result in an acceleration of regulatory compliance activities needed for a disposal decision, which could result in permanent disposal of transuranic waste earlier than the previous test program and regulatory compliance strategy. The Revised Test Strategy changes the near-term program activities for the WIPP site. The revised strategy deletes radioactive waste tests at the WIPP, prior to completing all activities for initiating disposal operations, and consequently the need to maintain readiness to receive waste in the near-term. However, the new strategy enables the DOE to pursue an earlier disposal decision, supported by an accelerated regulatory compliance strategy. With the new strategy, the WIPP must prepare for disposal operations in early 1998. This Westinghouse Waste Isolation Division (WID) Transition Plan addresses the WID programmatic, budgetary, and personnel changes

to conform to the Revised Test Strategy, and to support the accelerated compliance strategy and earlier disposal operations at the WIPP.

11698 (ECN-RX–93-035) **Recycling long-lived waste components in high-flux thermal systems.** Gruppelaar, H.; Franken, W.M.P. Netherlands Energy Research Foundation (ECN), Petten (Netherlands). Mar 1993. 6p. Order Number DE94747265. Source: OSTI; NTIS.

TRANSMUTATION/hfr reactor; FISSION PRODUCTS/transmutation; ACTINIDE NUCLEI/transmutation; TRANSMUTATION; RADIOACTIVE WASTES; THERMAL NEUTRONS; NEUTRON FLUX; RESEARCH PROGRAMS; INTERNATIONAL COOPERATION; YEARS LIVING RADIOISOTOPES; ACTINIDE BURNER REACTORS

11699 (ETDE-IT–94-25) **Criticality safety analysis of accelerator transmutation waste system.** Landeyro, P.A. (ENEA, Casaccia (Italy)); Cepraga, D.G.; Orazi, A. No corporate text available. 1993. 12p. (CONF-930608–3: Safewaste '93: the final disposal of nuclear waste, Avignon (France), 13-18 Jun 1993). Order Number DE94752544. Source: OSTI; NTIS (US Sales Only).

The Accelerator Transmutation Waste system (ATW) is under development at the Los Alamos National Laboratory. It consists of a particle accelerator producing a proton beam having an energy of 1.5 GeV. These particles are introduced into the upper part of a molten Pb-Bi column and they produce, by a spallation reaction, a high strength neutron flux, $1.0x10^{16}$ n/(square centimeters sec). The neutrons enter a heavy water blanket where actinides and long-lived fission products circulate in vertical tubes. The goal of this research effort is to perform an independent verification of the feasibility of actinide burning in the ATW system. The work is divided into four tasks: (a) production of an actinide and long-lived fission product cross section library from JEF 2.2; (b) simulation, using MCNP and KENO IV Monte Carlo codes, of the ATW configurations existing in literature; (c) validation of the cross sections by comparison of Keff and reaction rate results, calculated with MCNP and KENO IV, with experimental benchmarks and intercomparison between calculations of a PWR unit cell and the computations carried out with various codes and cross section libraries (NEACRF criticality working group data); (d) simulation of the ATW configuration. The two first tasks are almost complete with excellent agreement between this study's results and those of Los Alamos.

11700 (FEMP/SUB–068) **Proceedings of the workshop on transite decontamination dismantlement and recycle/disposal.** Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States); Cincinnati Univ., OH (United States). Coll. of Engineering. [1993]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-9302160–: Workshop on issues at the Fernald Environmental Management project, Cincinnati, OH (United States), 3-4 Feb 1993). Order Number DE94005364. Source: OSTI; NTIS; INIS; GPO Dep.

On February 3–4, 1993, a workshop was conducted to examine issues associated with the decontamination, dismantlement, and recycle/disposal of transite located at the US Department of Energy Fernald site near Cincinnati, OH. The Fernald Environmental Management Project (FEMP) is a Superfund Site currently undergoing remediation. A major objective of the workshop was to assess the state-of-the-art of transite remediation, and generate concepts that could be useful to the Fernald Environmental Restoration Management Co. (FERMCO) for remediation of transite. Transite is a building material consisting of asbestos fiber and cement and may be radioactively contaminated as a result of past uranium processing operations at the FEMP. Many of the 100 buildings within the former uranium production area were constructed of transite siding and roofing and consequently, over 180,000 m^2 of transite must be disposed or recycled. Thirty-six participants representing industry, academia, and government institutions such as the EPA and DOE assembled at the workshop to present their experience with transite, describe work in progress, and address the issues involved in remediating transite.

11701 (HW–38308) **Nitric acid decontamination facilities 100-Areas.** Hubbard, E.T. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 26 Jul 1955. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006959. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report presents an analysis of the use of nitric acid in dummy decontamination.

11702 (HW–67313) **Birch recovery from stored waste.** MacCready, W.K. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 3 Nov 1960. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006693. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD RESERVATION/radioactive waste storage; MATERIALS RECOVERY; RADIOACTIVE WASTE PROCESSING; COST; SCHEDULES; TANKS; UNDERGROUND STORAGE

11703 (HW–81295-12) **Radioactive liquid waste disposal for December, 1964.** Wilson, R.H. Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 17 Feb 1965. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007898. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. LIQUID WASTES/radioactive waste disposal; RADIOACTIVE WASTES/ground disposal; HAPO; PUREX PROCESS; REDOX PROCESS; URANIUM; PLUTONIUM; SWAMPS

11704 (INIS-JP–018, pp. 187-194) **Dose evaluation by the Q system for LLW bitumen packages in fire environment.** Watabe, N. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan). Abiko Research Lab.); Ozaki, S.; Iida, T.; Akamatsu, H. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Since there are a lot of bitumen packages and plastic packages which correspond to 'combustible solids', the problems of the release ratio of radionuclides in fire accident and radiation dose of public or transport workers should be discussed in advance besides the requirements of LSA material, supposing the severe fire accident during transport by road or transport by vessel for the worst. In CRIEPI, small samples and full-scale models with non-radioactive nuclides were made and burned in furnace, then released nuclides were collected and analyzed. In this report, radiation dose of public in fire accident were calculated with the Q system regulated in the IAEA Safety Standards. It has become clear that activity limits (ex. 100A2) for combustible LSA material regulated in '85 IAEA regulations is practically correct. Besides, according to the results of the calculation for atmospheric diffusion, it is confirmed that the evaluating conditions adopted in the Q system are appropriate. (J.P.N.).

11705 (KCP–613-5236) **Automated accountability of hazardous materials at AlliedSignal Inc., Kansas City Division.** Depew, P.L. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-931188–2: 17. annual training resources and data exchange conference: integrating training requirements and expectations, Indianapolis, IN (United States), 15-17 Nov 1993). Order Number DE94004815. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE) Kansas City Plant (KCP), currently operated by AlliedSignal Inc. has developed a comprehensive Hazardous Material Information System (HMIS). The purpose of this system is to provide a practical and automated method to collect, analyze and distribute hazardous material information to DOE, KCP associates, and regulatory agencies. The drivers of the HMIS are compliance with OSHA Hazard Communications, SARA reporting, pollution prevention, waste minimization, control and tracking of hazards, and emergency response. This report provides a discussion of this system.

11706 (LA–12652-MS) **Mineralogy and clinoptilolite K/Ar results from Yucca Mountain, Nevada, USA: A potential high-level radioactive waste repository site.** WoldeGabriel, G.; Broxton, D.E.; Bish, D.L.; Chipera, S.J. Los Alamos National Lab., NM (United States). Nov 1993. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005018. Source: OSTI; NTIS; INIS; GPO Dep.

The Yucca Mountain Site Characterization Project is investigating Yucca Mountain, Nevada, as a potential site for a high-level nuclear waste repository. An important aspect of this evaluation is to understand the geologic history of the site including the diagenetic processes that are largely responsible for the present-day chemical and physical properties of the altered tuffs. This study evaluates the use of K/Ar geochronology in determining the alteration history of the zeolitized portions of Miocene tuffs at Yucca Mountain. Clinoptilolite is not generally regarded as suitable for dating because of its open structure and large ion-exchange capacity. However, it is the most abundant zeolite at Yucca Mountain and was selected for this study to assess the feasibility of dating the zeolitization process and/or subsequent processes that may have affected the zeolites. In this study we examine the ability of this mineral to retain all or part of its K and radiogenic Ar during diagenesis and evaluate the usefulness of the clinoptilolite K/Ar dates for determining the history of alteration.

11707 (LA–12703-SR) **Los Alamos National Laboratory Yucca Mountain Site Characterization Project 1992 quality program status report.** Bolivar, S.L. (and others); Burningham, A.; Chavez, P. Los Alamos National Lab., NM (United States). Mar 1994. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007726. Source: OSTI; NTIS; INIS; GPO Dep.

This status report summarizes the activities and accomplishments of the Los Alamos Yucca Mountain Site Characterization Project's quality assurance program for calendar year 1992. The report includes major sections on Program Activities and Trend Analysis. Program Activities are discussed periodically at quality meetings. The most significant issue addressed in 1992 has been the timely revision of quality administrative procedures. The procedure revision process was streamlined from 55 steps to 7. The number of forms in procedures was reduced by 38%, and the text reduced by 29%. This allowed revision in 1992 of almost half of all implementing procedures. The time necessary to complete the revision process (for a procedure) was reduced from 11 months to 3 months. Other accomplishments include the relaxation of unnecessarily strict training requirements, requiring quality assurance reviews only from affected organizations, and in general simplifying work processes. All members of the YMP received training to the new Orientation class Eleven other training classed were held. Investigators submitted 971 records to the Project and only 37 were rejected. The software program has 115 programs approved for quality-affecting work. The Project Office conducted 3 audits and 1 survey of Los Alamos activities. We conducted 14 audits and 4 surveys. Eight corrective action reports were closed, leaving only one open. Internally, 22 deficiencies were recognized. This is a decrease from 65 in 1991. Since each deficiency requires about 2 man weeks to resolve, the savings are significant. Problems with writing acceptable deficiency reports have essentially disappeared. Trend reports for 1992 were examined and are summarized herein. Three adverse trends have been closed; one remaining adverse trend will be closed when the affected procedures are revised. The number of deficiencies issued to Los Alamos compared to other participants is minimal.

11708 (LA-UR–93-4455) **Criticality safety analysis of Hanford Waste Tank 241-101-SY.** Perry, R.T.; Sapir, J.L.; Krohn, B.J. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940482–1: American Nuclear Society (ANS) topical meeting, Knoxville, TN (United States), 11-15 Apr 1994). Order Number DE94005085. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a safety assessment for proposed pump mixing operations to mitigate episodic gas releases in Tank 241-101-SY at the Hanford Site, Richland, Washington, a criticality safety analysis was made using the Sn transport code ONEDANT. The tank contains approximately one million gallons of waste and an estimated 910 G of plutonium. the criticality analysis considers reconfiguration and underestimation of plutonium content. The results indicate that Tank SY-101 does not present a criticality hazard. These methods are also used in criticality analyses of other Hanford tanks.

11709 (LA-UR–94-187) **Process analytical chemistry applied to actinide waste streams.** Day, R.S. Los Alamos National Lab., NM (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940149–2: 8. international forum on process analytical chemistry, Houston, TX (United States), 24-26 Jan 1994). Order Number DE94006256. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy is being called upon to clean up it's legacy of waste from the nuclear complex generated during the cold war period. Los Alamos National Laboratory is actively involved in waste minimization and waste stream polishing activities associated with this clean up. The Advanced Testing Line for Actinide Separations (ATLAS) at Los Alamos serves as a developmental test bed for integrating flow sheet development of nitric acid waste streams with process analytical chemistry and process control techniques. The wastes require processing in glove boxes because of the radioactive components, thus adding to the difficulties of making analytical measurements. Process analytical chemistry methods provide real-time chemical analysis in support of existing waste stream operations and enhances the development of new waste stream polishing initiatives. The instrumentation and methods being developed on ATLAS are designed to supply near-real time analyses on virtually all of the chemical parameters found in nitric acid processing of actinide waste. These measurements supply information on important processing parameters including actinide oxidation states, free acid concentration, interfering anions and metal impurities.

11710 (LA-UR–94-361) **Hazardous Waste Treatment Facility and skid-mounted treatment systems at Los Alamos.** Lussiez, G.W.; Zygmunt, S.J. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–7: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006152. Source: OSTI; NTIS; INIS; GPO Dep.

To centralize treatment, storage, and areas for hazardous wastes, Los Alamos National Laboratory has designed a 1115 m2 hazardous waste treatment facility. The facility will house a treatment room for each of four kinds of wastes: nonradioactive characteristic wastes, nonradioactive listed wastes, radioactive characteristic wastes, and radioactive listed wastes. The facility will be used for repacking labpacks; bulking small organic waste volumes; processing scintillation vials; treating reactives such as lithium hydride and pyrophoric uranium; treating contaminated solids such as barium sand; treating plating wastes and other solutions with heavy metals and oxidizing organics: Separate treatment rooms will allow workers to avoid mixing waste types and prevent cross-contamination. The ventilation air from the treatment areas may contain hazardous or radioactive dust. Gas may also leak from process equipment. The gas treatment process includes separating solids and gases and neutralization or adsorption of the hazardous gases. The ventilation air from each room will first be filtered before being scrubbed in a common gas caustic scrubber on an outside pad. There are two levels of exhaust in each treatment room, one for heavy gases and another for light gases. Several features help mitigate or eliminate hazards due to spills and releases: each treatment room is sealed and under slight negative pressure; each room has its own HEPA filtration; to avoid mixing of incompatible wastes and reagents, portable individual spill-containment trays are used for skids, to limit the danger of spills, the waste is directly transferred from outside storage to the treatment room; to mitigate the consequences of a gas release in the room, mobile hoods are connected to the exhaust-air treatment system; the floor, walls, ceilings, fixtures, ducts, and piping are made of acid-resistant material or are coated.

11711 (LA-UR–94-362) **Decontaminating lead bricks and shielding.** Lussiez, G. Los Alamos National Lab., NM (United

States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–2: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006153. Source: OSTI; NTIS; INIS; GPO Dep.

Lead used for shielding is often surface contaminated with radioisotopes and is therefore a RCRA D008 mixed waste. The technology-based standard for treatment is macroencapsulation. However, decontaminating and recycling the clean lead is a more attractive solution. Los Alamos National Laboratory decontaminates material and equipment contaminated with radioisotopes. Decontaminating lead poses special problems because of the RCRA hazard classification and the size of the inventory, now about 50 tons and likely to grow substantially of planned decommissioning operations. Thus lead, in the form of bricks and other shield shapes, is surface contaminated with fission products. One of the best methods for contaminated lead is removing the superficial layer of contamination with an abrasive medium under pressure. For lead, a mixture of alumina with water and air at about 40 psig rapidly and effectively decontaminates the lead. The abrasive medium is sprayed onto the lead in a scaled-off area. The slurry of abrasive and particles of lead falls through a floor and is collected in a sump. A pump sends the slurry mixture back to the spray gun, creating a continuous process. The process generates small volumes of lead slurry that can be solidified and, because it passes the TCLP, is not a mixed waste. The decontaminated lead can be released for recycling.

11712 (LA-UR–94-363) **Development of a process to neutralize water-reactive wastes.** Lussiez, G.; Dziewinski, J. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–6: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006154. Source: OSTI; NTIS; INIS; GPO Dep.

The mixed waste storage area at Los Alamos National Laboratory contains a considerable amount of lithium hydride and other water-reactive wastes. A process to neutralize these wastes by controlled hydration in an atmosphere of humid nitrogen is being developed. The kinetics of reaction of lithium hydride with water vapor has been studied at bench scale. The reaction progress can be predicted using the Unreacted Shrinking Core Model for noncatalytic solid-fluid reactions. This model will be utilized in designing of a skid-mounted treatment unit to neutralize water-reactive wastes.

11713 (LA-UR–94-409) **Determining site-specific drum loading criteria for storing combustible ^{238}Pu waste.** Marshall, R.S. (Los Alamos National Lab., NM (United States)); Callis, E.L.; Cappis, J.H.; Espinoza, J.M.; Foltyn, E.M.; Reich, B.T.; Smith, M.C. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–13: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006162. Source: OSTI; NTIS; INIS; GPO Dep.

Waste containing hydrogenous-combustible material contaminated with ^{238}Pu can generate hydrogen gas at appreciable rates through alpha radiolysis. To ensure safe transportation of WIPP drums, the limit for ^{238}Pu-combustible waste published in the WIPP TRUPACT-11 CONTENT (TRUCON) CODES is 21 milliwafts per 55 gallon drum. This corresponds to about 45 milligrams of $^{238}PuO_2$ used for satellite heat source-electrical generators. The Los Alamos waste storage site adopted a ^{238}Pu waste storage criteria based on these TRCUCON codes. However, reviews of the content in drums of combustible waste generated during heat source assembly at Los Alamos showed the amount of ^{238}Pu is typically much greater than 45 milligrams. It is not feasible to appreciably reduce Los Alamos ^{238}Pu waste drum loadings without significantly increasing waste volumes or introducing unsafe practices. To address this concern, a series of studies were implemented to evaluate the applicability of the TRUCON limits for storage of this specific waste. Addressed in these evaluations were determination of the hydrogen generation rate, hydrogen diffusion rates through confinement layers and vent filters, and packaging requirements specific to Los Alamos generated ^{238}Pu contaminated combustible waste. These studies also showed that the multiple-layer packaging practices in use at Los Alamos could be relaxed without significantly increasing the risk of contamination. Based on a model developed to predict H_2 concentrations in packages and drum headspace, the site specific effective hydrogen generation rate, and hydrogen-diffusion values, and revising the waste packaging practices, we were able to raise the safe loading limit for ^{238}Pu waste drums for on site storage to the gram levels typical of currently generated ^{238}Pu waste.

11714 (LA-UR–94-570) **Design document for landfill capping Prototype Decision Support System: Draft 1.0.** Stone, J.J. (Los Alamos National Lab., NM (United States)); Paige, G.; Hakonson, T.E.; Lane, L.J. Los Alamos National Lab., NM (United States). Jan 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007577. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of the Prototype Decision Support System for shallow land burial project is to "Develop a Decision Support System tool which incorporates simulation modeling and multi-objective decision theory for the purpose of designing and evaluating alternative trench cap designs for mixed waste landfill covers. The goal is to improve the quality of technical information used by the risk manager to select landfill cover designs while taking into account technological, economical, and regulatory factors." The complexity of the technical and non-technical information, and how the information varies in importance across sites, points to the need for decision analysis tools that provide a common basis for integrating, synthesizing, and valuing the decision input. Because the cost of remediating thousands of contaminated DOE sites is projected to be in the 10's–100's of billions of dollars, methods will be needed to establish cleanup priorities and to help in the selection and evaluation of cost effective remediation alternatives. Even at this early stage in DOE's cleanup program, it is certain that capping technologies will be heavily relied upon to remediate the 3000+ landfills on DOE property. Capping is favored in remediating most DOE landfills because, based on preliminary baseline risk assessments, human and ecological risks are considered to be low at most of these sites and the regulatory requirements for final closure of old landfills can be met using a well designed cap to isolate the buried waste. This report describes a program plan to design, develop, and test a decision support system (DSS) for assisting the DOE risk manager in evaluating capping alternatives for radioactive and hazardous waste landfills. The DOE DSS will incorporate methods for calculating, integrating and valuing technical, regulatory, and economic criteria.

11715 (LA-UR–94-593) **Capping as an alternative for remediating radioactive and mixed waste landfills.** Hakonson, T.E. (Colorado State Univ., Fort Collins, CO (United States). Dept. of Fishery and Wildlife Biology). Los Alamos National Lab., NM (United States). [1994]. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007570. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes some of the regulatory and technical issues concerning the use of capping as a containment strategy for radioactive and hazardous waste. Capping alternatives for closure of landfills is not just an engineering problem, but rather involves complex physical, biological, and chemical processes requiring a multidisciplinary approach to develop designs that will work over the long haul and are cost-effective. Much of the information has been distilled from regulatory and guidance documents and a compilation of research activities on waste disposal, contaminant transport processes, and technology development for landfills that has been conducted over the last 21 years.

11716 (LA-UR–94-607) **Mixed Waste Treatment Project: LLNL and LANL computer simulations of integrated flowsheets.** Camp, D.W. (Lawrence Livermore National Lab., CA (United States)); Dietsche, L.J.; Upadhye, R.S.; Borduin, L.C.; Pendergrass, J.A.; Thompson, T.K. Los Alamos National Lab., NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–37: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007563. Source: OSTI; NTIS; INIS; GPO Dep.

Computer simulations of mixed waste processing flowsheets using ASPEN PLUS process simulation software were completed by a joint Lawrence Livermore National Laboratory/Los National Laboratory (LLNL/LANL) effort for the US Department of Energy Mixed Waste Treatment Project. The LLNL model used relatively detailed synthesized chemical "cocktails" to simulate waste streams. The LANL approach used less detail but made extensive use of simple steam splitters and thermodynamic coal models for combustible waste compositions. The two modeling approaches agreed within 16% for the product streams and within 25% for the auxiliary fuel rate. The discrepancy between the auxiliary fuel rates was traced to different methods of handling organics in lab packs and scintillation vials with the process models. The ASPEN models are valuable tools for evaluating waste processing flowsheets.

11717 (LA-UR–94-715) **Simulated waste package test in salt.** Kalia, H.N. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940553–11: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94007550. Source: OSTI; NTIS; INIS; GPO Dep.

The Salt Repository Site Characterization Project Office (SRPO), of the US Department of Energy (DOE) Office of the Civilian Radioactive Waste Management (OCRWM), in cooperation with Federal Republic of Germany (FRG), simulated a waste package test at Asse Salt Mine (Asse). The purpose of this test was to determine the effect of heat produced by the decay of High-Level Radioactive Waste (HLW) on: Migration of brine moisture; Thermomechanical response of the salt; Geomechanical response of the room mined in salt; Corrosion on potential HLW waste package container materials; and Generation of gases. This paper describes the these performed, results obtained, and the performance of instruments and data acquisition system deployed.

11718 (LBL–30043, pp. 42-63) **Normal joint stiffness a function of spatial geometry.** Hopkins, D.L.; Cook, N.G.W.; Myer, L.R. Lawrence Berkeley Lab., CA (United States). Dec 1990. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

Normal joint stiffness was introduced by Goodman et al. (1968) as a parameter than can be used to describe the potential behavior of a joint. An advantage of joint stiffness as a prediction parameter is that it can be measured in the laboratory without detailed analysis of the joints themselves. Stiffness has been shown to be an important parameter in determining seismic wave propagation across joints (e.g. Hopkins, 1990, and Pyrak-Nolte et al., 1990) and is probably related to their hydraulic properties. While stiffness is a function of contact area, it will be shown that stiffness is not uniquely determined by contact area. The objective of this study is ti examine the relationships between normal joint stiffness and asperity dimensions, the spatial geometry of the asperities, and surface roughness.

11719 (NEI-DK–1359) **Conservation and retrieval of information: Elements of a strategy to inform future societies about nuclear waste repositories.** Nordiske Seminar- og Arbejdsrapporter, 1993:596, Nordiske Seminar- og Arbejdsrapporter, 1993:596. Jensen, M. Nordisk Kernesikkerhedsforskning, Roskilde (Denmark). Aug 1993. 116p. Contract NKS/KAN-1.3. Order Number DE94618265. Source: OSTI; NTIS; INIS.

High-level waste from nuclear power generation will remain radioactive for thousands of years even though 99% of the radioactivity will have decayed within the first millennium. For a hypothetical group involved in future actions to retrieve or repair a repository, information about its location, design, and content would be necessary. The need of such groups can be used to design the information that should be kept in a waste archive. Two main strategies exist for long-germ information transfer, one which links information thorough successive transfers of archived material and other forms of knowledge in society, and one - such as marking the site with a monument - relying upon a direct link from the present to the distant future. Digital methods are not recommended for long-term storage, but digital processing may be a valuable tool to structure information summaries, and in the creation of better long-lasting records. Advances in archive management should also be pursued to widen the choice of information carriers of high durability. In the Nordic countries, during the first few thousand years, and perhaps up to the next period of glaciation, monuments at a repository site may be used to warn the public of the presence of dangerous waste. But messages from such markers may pose interpretation problems as we have today for messages left by earlier societies such as rune inscriptions. Since the national borders may change in the time scale relevant for nuclear waste, the creation of an international archive for all radioactive wastes would represent an improvement as regards conservation and retrieval of information. (EG).

11720 (NUREG–1486) **Final Safety Evaluation Report to license the construction and operation of a facility to receive, store, and dispose of 11e.(2) byproduct material near Clive, Utah (Docket No. 40-8989).** Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Material Safety and Safeguards. Jan 1994. 102p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The Final Safety Evaluation Report (FSER) summarizes the US Nuclear Regulatory Commission (NRC) staff's review of Envirocare of Utah, Inc.'s (Envirocare's) application for a license to receive, store, and dispose of uranium and thorium byproduct material (as defined in Section 11e.(2) of the Atomic Energy Act of 1954, as amended) at a site near Clive, Utah. Envirocare proposes to dispose of high-volume, low-activity Section 11e.(2) byproduct material in separate earthen disposal cells on a site where the applicant currently disposes of naturally occurring radioactive material (NORM), low-level waste, and mixed waste under license by the Utah Department of Environmental Quality. The NRC staff review of the December 23, 1991, license application, as revised by page changes dated July 2 and August 10, 1992, April 5, 7, and 10, 1993, and May 3, 6, 7, 11, and 21, 1993, has identified open issues in geotechnical engineering, water resources protection, radon attenuation, financial assurance, and radiological safety. The NRC will not issue a license for the proposed action until Envirocare adequately resolves these open issues.

11721 (NUREG/CR–6063) **INTRAVAL Phase 2: Modeling testing at the Las Cruces Trench Site.** Hills, R.G. (New Mexico State Univ., Las Cruces, NM (United States). Dept. of Mechanical Engineering); Wierenga, P.J.; Luis, S.; McLaughlin, D.; Rockhold, M.; Xiang, J.; Scanlon, B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; New Mexico State Univ., Las Cruces, NM (United States). Dept. of Mechanical Engineering; Arizona Univ., Tucson, AZ (United States). Dept. of Soil and Water Science. Jan 1994. 140p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Several field experiments have been performed by scientists from the University of Arizona and New Mexico State University at the Las Cruces Trench Site to provide data tc test deterministic and stochastic models for water flow and solute transport. These experiments were performed in collaboration with INTRAVAL, an international effort toward validation of geosphere models for the transport of radionuclides. During Phase I of INTRAVAL, qualitative comparisons between experimental data and model predictions were made using contour plots of water contents and solute concentrations. Detailed quantitative comparisons were not made. To provide data for more rigorous model testing, a third Las Cruces Trench experiment was designed by scientists from the University of Arizona and New Mexico State University. Modelers from the Center for Nuclear Waste Regulatory Analysis, Massachusetts Institute of Technology, New Mexico State University, Pacific Northwest Laboratory, and the University of Texas provided predictions of water flow and tritium transport to New Mexico State University for analysis. The corresponding models assumed soil characterizations ranging from uniform to deterministically heterogeneous to stochastic. This report presents detailed quantitative comparisons to field data.

11722 (NUREG/CR–6114-Vol.1) **Application of an infiltration evaluation methodology to a hypothetical low-level waste disposal facility: Volume 1.** Meyer, P.D. (Pacific Northwest Lab.,

Richland, WA (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 35p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–8842-Vol.1). Source: OSTI; NTIS; INIS; GPO.

This report provides an analysis of infiltration and percolation at a hypothetical low-level waste (LLW) disposal facility was carried out. The analysis was intended to illustrate general issues of concern in assessing the performance of LLW disposal facilities. Among the processes considered in the analysis were precipitation, runoff, information, evaporation, transpiration, and redistribution. The hypothetical facility was located in a humid environment characterized by frequent and often intense precipitation events. The facility consisted of a series of concrete vaults topped by a multilayer cover. Cover features included a sloping soil surface to promote runoff, plant growth to minimize erosion and promote transportation, a sloping clay layer, and a sloping capillary barrier. The analysis within the root zone was carried out using a one-dimensional, transient simulation of water flow. Below the root zone, the analysis was primarily two-dimensional and steady-state.

11723 (NUREG/CR–6138) **User's guide for simplified computer models for the estimation of long-term performance of cement-based materials.** Plansky, L.E. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Seitz, R.R. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1994. 76p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (EGG–2719). Source: OSTI; NTIS; INIS; GPO.

This report documents user instructions for several simplified subroutines and driver programs that can be used to estimate various aspects of the long-term performance of cement-based barriers used in low-level radioactive waste disposal facilities. The subroutines are prepared in a modular fashion to allow flexibility for a variety of applications. Three levels of codes are provided: the individual subroutines, interactive drivers for each of the subroutines, and an interactive main driver, CEMENT, that calls each of the individual drivers. The individual subroutines for the different models may be taken independently and used in larger programs, or the driver modules can be used to execute the subroutines separately or as part of the main driver routine. A brief program description is included and user-interface instructions for the individual subroutines are documented in the main report. These are intended to be used when the subroutines are used as subroutines in a larger computer code.

11724 (NUREG/CR–6147-Vol.1) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 1: Executive summary.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 85p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 through 7 contain Appendices A through P with supporting information.

11725 (NUREG/CR–6147-Vol.2) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 2: Main report – Part A.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 304p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the, waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 through 7 contain Appendices A through P with supporting information.

11726 (NUREG/CR–6147-Vol.3) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 3: Main report – Part B.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 289p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative

distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 to 7 contain Appendices A to P with supporting information.

11727 (NUREG/CR–6147-Vol.4) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 4: Appendices A–E.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 334p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 to 7 contain Appendices A to P with supporting information.

11728 (NUREG/CR–6147-Vol.5) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 5: Appendix F.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 706p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 through 7 contain Appendices A through P with supporting information.

11729 (NUREG/CR–6147-Vol.6) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 6: Appendices G–J.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 611p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 through 7 contain Appendices A through P with supporting information.

11730 (NUREG/CR–6147-Vol.7) **Characterization of Class A low-level radioactive waste 1986–1990: Volume 7: Appendices K–P.** Dehmel, J.C. (S. Cohen & Associates, Inc., McLean, VA (United States)); Loomis, D.; Mauro, J.; Kaplan, M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Cohen (S.) and Associates, Inc., McLean, VA (United States); Eastern Research Group, Inc., Lexington, MA (United States). Jan 1994. 463p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Under contract to the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, the firms of S. Cohen & Associates, Inc. (SC&A) and Eastern Research Group (ERG) have compiled a report that describes the physical, chemical, and radiological properties of Class-A low-level radioactive waste. The report

also presents information characterizing various methods and facilities used to treat and dispose non-radioactive waste. A database management program was developed for use in accessing, sorting, analyzing, and displaying the electronic data provided by EG&G. The program was used to present and aggregate data characterizing the radiological, physical, and chemical properties of the waste from descriptions contained in shipping manifests. The data thus retrieved are summarized in tables, histograms, and cumulative distribution curves presenting radionuclide concentration distributions in Class-A waste as a function of waste streams, by category of waste generators, and regions of the United States. The report also provides information characterizing methods and facilities used to treat and dispose non-radioactive waste, including industrial, municipal, and hazardous waste regulated under Subparts C and D of the Resource Conservation and Recovery Act (RCRA). The information includes a list of disposal options, the geographical locations of the processing and disposal facilities, and a description of the characteristics of such processing and disposal facilities. Volume 1 contains the Executive Summary, Volume 2 presents the Class-A waste database, Volume 3 presents the information characterizing non-radioactive waste management practices and facilities, and Volumes 4 through 7 contain Appendices A through P with supporting information.

11731 (ORNL/ER–204) **Field Operations Procedures Manual for environmental monitoring in Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Dec 1993. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008062. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses meteorological monitoring activities that will be conducted in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-burial land disposal facility for low-level radioactive waste at the Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and managed by Martin Marietta Energy Systems, Inc. Meteorological monitoring of various climatological parameters (e.g., temperature, wind speed, humidity) will be collected by instruments installed at WAG 6. Data will be recorded electronically at frequencies varying from 5-min intervals to 1-h intervals, dependent upon parameter. The data will be downloaded every 2 weeks, evaluated, compressed, and uploaded into a WAG 6 data base for subsequent use. The meteorological data will be used in water balance calculations in support of the WAG 6 hydrogeological model.

11732 (ORNL/M–3022) **Environmental surveillance data report for the first quarter of 1993.** Gheesling, S.E.; Gideon, J.C.; Gregory, S.M.; Hamilton, L.V.; Horwedel, B.M.; Loffman, R.S.; Salmons, M.C.; Stevens, M.M. Oak Ridge National Lab., TN (United States). Oct 1993. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002775. Source: OSTI; NTIS; GPO Dep.

The Environmental Surveillance and Protection Section within the Office of Environmental Compliance and Documentation at the Oak Ridge National Laboratory (ORNL) is responsible for the development and implementation of an envirorunental program to (1) ensure compliance with all federal, state, and Department of Energy (DOE) reporting requirements to quantitatively demonstrate prevention, control, and abatement of environmental pollution; (2) monitor the adequacy of containment and effluent controls; and (3) assess impacts of releases from ORNL facilities on the environment. Environmental monitoring, as defined by the Regulatory Guide, consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the collection and analysis of samples or measurements of liquid and gaseous effluents. Environmental surveillance is the collection and analysis of samples, or direct measurements of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs. Monthly or quarterly summaries are presented in this report for each medium sampled. All data are rounded to two significant digits. The summary tables generally give the number of samples collected during the period and the maximum, minimum, average, and standard error of the mean (SE) values of parameters for which determinations were made.

11733 (PNL-SA–21829) **Separation of strontium-90 from Hanford high-level radioactive waste.** Lumetta, G.J.; Wagner, M.J.; Jones, E.O. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931043–10: 8. symposium on separation science and technology for energy applications, Knoxville, TN (United States), 24-28 Oct 1993). Order Number DE94007487. Source: OSTI; NTIS; INIS; GPO Dep.

Current guidelines for disposing of high-level radioactive wastes stored in underground tanks at the US Department of Energy's Hanford Site call for vitrifying high-level waste (HLW) in borosilicate glass and disposing the glass canisters in a deep geologic repository. Disposition of the low-level waste (LLW) is yet to be determined, but it will likely be immobilized in a glass matrix and disposed of on site. To lower the radiological risk associated with the LLW form, methods are being developed to separate ^{90}Sr from the bulk waste material so this isotope can be routed to the HLW stream. A solvent extraction method is being investigated to separate ^{90}Sr from acid-dissolved Hanford tank wastes. Results of experiments with actual tank waste indicate that this method can be used to achieve separation of ^{90}Sr from the bulk waste components. Greater than 99% of the ^{90}Sr was removed from an acidic dissolved sludge solution by extraction with di-tbutylcyclohexano-18-crown-6 in 1-octanol (the SREX process). The major sludge components were not extracted.

11734 (PNL-SA–22723) **The effect of gamma radiation on reference electrodes and platinum and carbon steel bare metal electrodes in a simulated waste solution.** Danielson, M.J. Pacific Northwest Lab., Richland, WA (United States). Mar 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940222–12: Corrosion 94: National Association of Corrosion Engineers (NACE) international annual conference, Baltimore, MD (United States), 28 Feb - 4 mar 1994). Order Number DE94008045. Source: OSTI; NTIS; GPO Dep.

Electrochemical potential measurements of materials in waste tanks are important in determining if the materials have a propensity for stress corrosion cracking and pitting. Potential measurement requires a reference electrode, but the effect of radiation on the potential generated by the reference electrode has been an unknown quantity. To determine the significance of the radiation effect, Pacific Northwest Laboratory conducted studies of five types of electrodes under gamma radiation at room temperature. The subjects were two types of silver, silver chloride reference electrodes, a mercury/calomel reference electrode, a platinum "flag", and a piece of A-537 carbon steel; the electrodes were exposed to a simulated caustic tank environment. The Fisher Scientific® silver/silver chloride and mercury/calomel reference electrodes showed essentially no radiation effects up to a flux of 2.IE6 R/h and fluence of 9.4E8 R, indicating they would be useful reference electrodes for in-tank studies. The Lazaran® silver/silver chloride electrode showed serious potential deviations at fluences of 2.E8 R but would be the electrode of choice in many situations because it is simple to maintain. Radiation affected the open circuit potential of both the platinum and carbon steel electrodes. This effect indicates that corrosion studies without radiation may not duplicate the corrosion processes expected in a waste tank. Mixed-potential theory was used to explain the radiation effects.

11735 (PNL-SA–23007) **Pre-design safety analyses of cesium ion-exchange compact processing unit.** Richmond, W.G.; Ballinger, M.Y. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931121–35: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94004786. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes an innovative radioactive waste pretreatment concept. This cost-effective, highly flexible processing approach is based on the use of Compact Processing Units (CPUs) to treat highly radioactive tank wastes in proximity to the tanks themselves. The units will be designed to treat tank wastes at rates

from 8 to 20 liters per minute and have the capacity to remove cesium, and ultimately other radionuclides, from 4,000 cubic meters of waste per year. This new concept is being integrated into waste per year. This new concept is being integrated into Hanford's tank farm management plans by a team of PNL and Westinghouse Hanford Company scientists and engineers. The first CPU to be designed and deployed will be used to remove cesium from Hanford double-shell tank (DST) supernatant waste. Separating Cs from the waste would be a major step toward lowering the radioactivity in the bulk of the waste, allowing it to be disposed of as a low-level solid waste form (e.g.,grout), while concentrating the more highly radioactive material for processing as high-level solid waste.

11736 (PNL-SA–23035) **A DOE manual: DOE Methods for Evaluating Environmental and Waste Management Samples.** Goheen, S.C. (and others); McCulloch, M.; Riley, R.G. Pacific Northwest Lab., Richland, WA (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–60: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008056. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Management inherently requires knowledge of the waste's chemical composition. The waste can often be analyzed by established methods; however, if the samples are radioactive, or are plagued by other complications, established methods may not be feasible. The US Department of Energy (DOE) has been faced with managing some waste types that are not amenable to standard or available methods, so new or modified sampling and analysis methods are required. These methods are incorporated into DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods), which is a guidance/methods document for sampling and analysis activities in support of DOE sites. It is a document generated by consensus of the DOE laboratory staff and is intended to fill the gap within existing guidance documents (e. g., the Environmental Protection Agency's (EPA's) Test Methods for Evaluating Solid Waste, SW-846), which apply to low-level or non-radioactive samples. DOE Methods fills the gap by including methods that take into account the complexities of DOE site matrices. The most recent update, distributed in October 1993, contained quality assurance (QA), quality control (QC), safety, sampling, organic analysis, inorganic analysis, and radioanalytical guidance as well as 29 methods. The next update, which will be distributed in April 1994, will contain 40 methods and will therefore have greater applicability. All new methods are either peer reviewed or labeled "draft" methods. Draft methods were added to speed the release of methods to field personnel.

11737 (PNL-SA–23271) **Evacuated canister system for removal of molten radioactive glass.** Ketner, G.L. (Pacific Northwest Lab., Richland, WA (United States)); Berger, D.N.; Liu, K.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931160–36: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94004771. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) has prepared a preliminary design for the West Valley Demonstration Project evacuated canister system. The function of the evacuated canister is to permit the remote removal of radioactive molten glass from a hot cell melter cavity during a planned melter shutdown. The proposed evacuated canister system consists of an L-shaped 4-in. 304L stainless steel (SS) schedule 40 pipe, sealed at one end with an aluminum plug and attached at the other end to a canister. Previous developments of evacuated canister drain systems at Hanford, the Savannah River Site and West Valley have been considered. Previous techniques to model glass flow have been evaluated. An upright design, that stationed the canister next to the melter, was originally proposed. Modifications to this design include supporting the canister horizontally above the melter using cranes, using an explosively bonded aluminum melt plug, and adding an internal structural reinforcement to the canister. While the canister is being filled, it is positioned and held above the melter at approximately 15° from horizontal by two turntable-mounted cranes. Because a limited amount of data exist on the performance of glass and stainless steel at high temperatures, testing is proposed to verify the canister's performance under high temperature conditions.

11738 (PNL-SA–23331) **Initial laboratory studies into the chemical and radiological aging of organic materials in underground storage tanks at the Hanford Complex.** Samuels, W.D. (Pacific Northwest Lab., Richland, WA (United States)); Camaioni, D.M.; Babad, H. Pacific Northwest Lab., Richland, WA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–61: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008055. Source: OSTI; NTIS; INIS; GPO Dep.

The underground storage tanks at the Hanford Complex contain wastes generated over many years from plutonium production and recovery processes, and mixed wastes from radiological degradation processes. The chemical changes of the organic materials used in the extraction processes have a direct bearing on several specific safety issues, including potential energy releases from these tanks. The major portion of organic materials that have been added to the tanks consists of tributyl phosphate, dibutyl phosphate, butyl alcohol, hexone (methyl isobutyl ketone), normal paraffin hydrocarbons (NPH), ethylenediaminetetraacetic acid (EDTA), hydroxyethylethylenediaminetriadetic acid (HEDTA), other complexants, and lesser quantities of ion exchange polymers and minor organic compounds. A study of how thermal and radiological processes that may have changed the composition of organic tanks constituents has been initiated after a review of the open literature revealed little information was available about the rates and products of these processes under basic pH conditions. This paper will detail the initial findings as they relate to gas generation, e.g. H_2, CO, NH_3, CH_4, and to changes in the composition of the organic and inorganic components brought about by "Aging" processes.

11739 (PNL-SA–23412) **The development of permanent isolation barriers for buried wastes in cool deserts: Hanford, Washington.** Link, S.O. (Pacific Northwest Lab., Richland, WA (United States)); Gee, G.W.; Wing, N.R. Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931242–1: 2. desert technology conference, Kona, HI (United States), 5-10 Dec 1993). Order Number DE94004780. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to present the results of research on surface hydrology and the role of plants and animals on permanent isolation barrier effectiveness at Hanford. These topics are a subset of a larger set of studies on permanent isolation barriers. A complete review of these tasks has been documented. We also discuss current work that tests our integrated scientific and engineering concepts on a large prototype barrier to determine if it can isolate buried wastes from environmental dispersion.

11740 (PNL-SA–23686) **Radioactive waste tank Initial Pretreatment Module (IPM) technology development and selection.** Beeman, G.H. (Pacific Northwest Lab., Richland, WA (United States)); Hansrote, G. Pacific Northwest Lab., Richland, WA (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–59: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008058. Source: OSTI; NTIS; INIS; GPO Dep.

The processing of nuclear materials at the Hanford Site has resulted in the accumulation of radioactive wastes stored in 177 single- and double-shell tanks (SSTs and DSTs). Fifty-four of the 177 tanks are currently on a tank watch list because organic chemicals and ferrocyanide compounds in the tanks present a potential fire or explosion hazard. In addition, one additional SST is under consideration for placement on the watch list because of high organic concentration. Seventeen of the watch list tanks require pretreatment, and two DST complexant concentrate waste tanks not on the watch list may also need pretreatment. The proposed Initial Pretreatment Module (IPM) is expected to resolve the safety concerns by destroying the organics and ferrocyanide compounds in the tank wastes. The primary objective of the IPM is to destroy or modify constituents that cause safety concerns in the watch list

tanks. A secondary objective is to enhance the cost effectiveness of processing the wastes by performing additional processing. Overall, IPM will achieve organic/ferrocyanide destruction (the primary goal) and will assist in the separation of cesium, strontium, and technetium from the tank wastes.

11741 (RCM–00692) **Colloid migration in groundwaters: Geochemical interactions of radionuclides with natural colloids: 2nd progress report. Period covered: May 1991 - May 1992.** Kim, J.I. (Technische Univ. Muenchen, Garching (Germany)); Delakowitz, B.; Zeh, P.; Probst, T.; Lin, X.; Ehrlicher, U.; Schauer, C. Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie. Jul 1992. 108p. Contract CEC FI2W/0084. Order Number DE94752377. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this joint research programme is to determine the significance of groundwater colloids in far field radionuclide migration. This is based on the characterization, quantification and theoretical interpretation of colloidal transport of radionuclides in selected Gorleben aquifer systems. These aquifers were chosen for their well characterized hydrological and geological properties and because they contain substantial colloids of different chemical compositions in addition to considerable quantities of chemical homologues for the tri-, tetra- and hexavalent actinides. (orig./BBR)

11742 (SAND–93-0817C) **Using an Augmented Lagrangian Method and block fracturing in the DDA method.** Lin, C.T. (Colorado Univ., Boulder, CO (United States). Dept. of Civil Engineering); Amadei, B.; Sture, S.; Jung, J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by US-DOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-76DP00789. Grant MS-9215397. (CONF-940506–3: 8. international conference on computer methods and advances in geomechanics, Morgantown, WV (United States), 22-28 May 1994). Order Number DE94005270. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents two extensions to the Discontinuous Deformation Analysis (DDA) method orginally proposed by Shi for modeling the response of blocky rock masses to mechanical loading. The first extension consists of improving the block contact algorithm. An Augmented Lagrangian Method is used to replace the Penalty Method orginally proposed. It allows Lagrange multipliers to be introduced without increasing the number of equations that need to be solved and thus, block contract forces can be calculated more accurately. A block fracturing capability based on a three-parameter Mohr-Coulomb criterion represents the second extension. It allows for shear or tensile fracturing of intact blocks and the formation of smaller blocks.

11743 (SAND–93-1888, pp. 9-12) **OTD Robotics Technology Development Program Overview.** Yarbrough, L. (DOE, Washington, DC (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

This contains the vugraph presentations for the OTD (Office of Technology Development) Robotics Technology Development Program Overview. Vugraphs included a title board and a FY94 Program Matrix chart.

11744 (SAND–93-1888, pp. 13-26) **A working example of RTDP/industry cooperation-CCA productization.** Bourgeois, S. (Lockhead Missiles and Space Co., Austin, TX (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

Vugraphs for this presentation included a title board for the Contaminant Analysis Automation (CAA) Program; CAA Program Introduction; Cleanup Description; The CAA Solution; Contaminant Analysis Automation; Contaminant Analysis Automation System; Development Approach; Schedule; Market Potential; CAA Status; Expanded CAA Team; and Conclusion.

11745 (SAND–93-1888, pp. 27-35) **Tank waste retrieval.** Bennett, D.W. (Pacific Northwest Labs., Richland, WA (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

Vugraphs for the presentation on Tank Waste Retrieval include a Mission Statement; Budget; Robotics Development System; Robotics Technology Development; Robotics Technology Support; Fiscal 93 Accomplishments; and TWR Test Bed Schedule.

11746 (SAND–93-1888, pp. 37-62) **Contaminant analysis automation.** Hollen, R.M. (Los Alamos National Labs., NM (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

Vugraphs for the presentation on Contaminant Analysis Automation included; a title board; a mission statement; CAA Team Members map; DOE Analysis Needs Survey; Hanford Sample Forecast; DOE's Current Limitations; Analytical Methods in the Laboratory; Automated Laboratory Paradigms; Standard Laboratory Modules; Standard Laboratory Module Sequence; SLM State Diagram; CAA Automated Laboratory Architecture; Data Interpretation Module; CAA Technology; Organic Extraction Procedures; Hardware/Software Requirements; Hardware Development Environment; Software Development Environment; Standard Analysis Method; Industrial/External Collaborations; Contaminant Analysis Automation Team Members; and Development Schedule.

11747 (SAND–93-1888, pp. 63-70) **Waste facility operations.** Ward, C.R. (Westinghouse Savannah River Co., Aiken, SC (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

The Waste Facility Operations presentation included the following vugraphs: Overview of Waste Facilities Operations Robotics Program; WFO FY93 Demonstration; WFO FY93 Major Thrusts; Remote Inspection and Survey of Drums; Drum Opening, Emptying and Transportation; AC Swing-Free Crane Control; Whole Drum Characterization; Telerobot Improvements; Mixed Waste Integrated Program Liason; WFO/WPO FY94 Demonstration; and FY94 Major Thrusts.

11748 (SAND–93-1888, pp. 71-110) **Waste processing operations.** Couture, S.A. (Lawrence Livermore National Labs., CA (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

Vugraphs from the presentation on Waste Processing Operations included: a title board; Purpose of the OTD Robotics Waste Processing Operations Program; Mixed Waste Treatment Project - Operations Flowsheet; Waste characterization, handling and sorting; General approach of tele-operational and autonomous singulation system; Vision based autonomous robot grasping;

Structured lighting; A histogram of the CT data reveals the heterogeneity of the DC-motor; A 1-D profile of the DC-motor CT data reveals the internal details and heterogeneity of this motor; Overall software layout; Automated processing testbeds - technology development; The processing line system will be comprised of three major stations; Debris decontamination - lead scarifying; Alpheus CO_2 pellet system; The scarifying action of CO_2 pellets; Integration required for FY93 WPO demonstration; WPO team member contributions; WPO major thrusts for FY 1994; WPO growth areas; OTD Waste Processing Operations objectives.

11749 (SAND–93-1888, pp. 125-144) **Cross cutting and advanced technology development.** Harrigan, R.W. (Sandia National Labs., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

The vugraphs for the presentation on Cross Cutting and Advanced Technology Development include: CC&AT Team Status Report; CC&AT Develops Technology Broadly Applicable to ER & WM Needs; FY93 CC&AT Budget Distribution by Major Thrusts; CC&AT is a Multilaboratory Effort; CC&AT Sensing Systems Characterize Waste Sites and Improve Safety; CC&AT Controls Technology Increases Speed and Improves Safety; The Univ. R&D Team Focuses on Needs Based Advanced Technology; Dual Arm Manipulation is a New CC&AT Major Thrust in FY93; Initial Cost/Benefit Analyses Show Robots Are Cost Effective; CC&AT Examined Modular Robotics in FY93; New CC&AT Directions for FY94; Robot System Simulation Couple with RTDP Hardware Demos Supports Faster & Cheaper Technology Development.

11750 (SAND–93-2174C) **Performance assessment of the Greater Confinement Disposal facility on the Nevada Test Site: Comparing the performance of two conceptual site models.** Baer, T.A. (GRAM Inc., Albuquerque, NM (United States)); Price, L.L.; Gallegos, D.P. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–1: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006195. Source: OSTI; NTIS; INIS; GPO Dep.

A small amount of transuranic (TRU) waste has been disposed of at the Greater Confinement Disposal (GCD) site located on the Nevada Test Site's (NTS) Radioactive Waste Management Site (RWMS). The waste has been buried in several deep (37 m) boreholes dug into the floor of an alluvial basin. For the waste to remain in its current configuration, the DOE must demonstrate compliance of the site with the TRU disposal requirements, 40 CFR 191. Sandia's approach to process modelling in performance assessment is to use demonstrably conservative models of the site. Choosing the most conservative model, however, can be uncertain. As an example, diffusion of contaminants upward from the buried waste in the vadose zone water is the primary mechanism of release. This process can be modelled as straight upward planar diffusion or as spherical diffusion in all directions. The former has high fluxes but low release areas, the latter has lower fluxes but is spread over a greater area. We have developed analytic solutions to a simple test problem for both models and compared the total integrated discharges. The spherical diffusion conceptual model results in at least five times greater release to the accessible environment than the planar model at all diffusivities. Modifying the planar model to allow for a larger release, however, compensated for the smaller original planar discharge and resulted in a new planar model that was more conservative that the spherical model except at low diffusivities.

11751 (SAND–93-2330/2) **Initial performance assessment of the disposal of spent nuclear fuel and high-level waste stored at Idaho National Engineering Laboratory: Volume 2: Appendices.** Rechard, R.P. (ed.). Sandia National Labs., Albuquerque, NM (United States). Dec 1993. 453p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008110. Source: OSTI; NTIS; INIS; GPO Dep.

This performance assessment characterized plausible treatment options conceived by the Idaho National Engineering Laboratory (INEL) for its spent fuel and high-level radioactive waste and then modeled the performance of the resulting waste forms in two hypothetical, deep, geologic repositories: one in bedded salt and the other in granite. The results of the performance assessment are intended to help guide INEL in its study of how to prepare wastes and spent fuel for eventual permanent disposal. This assessment was part of the Waste Management Technology Development Program designed to help the US Department of Energy develop and demonstrate the capability to dispose of its nuclear waste, as mandated by the Nuclear Waste Policy Act of 1982. The waste forms comprised about 700 metric tons of initial heavy metal (or equivalent units) stored at the INEL: graphite spent fuel, experimental low enriched and highly enriched spent fuel, and high-level waste generated during reprocessing of some spent fuel. Five different waste treatment options were studied; in the analysis, the options and resulting waste forms were analyzed separately and in combination as five waste disposal groups. When the waste forms were studied in combination, the repository was assumed to also contain vitrified high-level waste from three DOE sites for a common basis of comparison and to simulate the impact of the INEL waste forms on a moderate-sized repository, The performance of the waste form was assessed within the context of a whole disposal system, using the U.S. Environmental Protection Agency's Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 40 CFR 191, promulgated in 1985. Though the waste form behavior depended upon the repository type, all current and proposed waste forms provided acceptable behavior in the salt and granite repositories.

11752 (SAND–93-2441C) **Considerations for guidance for radioactive waste disposal arising from rules under 40 CFR 191 and 40 CFR 194.** Trauth, K.M. (Sandia National Labs., Albuquerque, NM (United States)); Bertram, S.G.; Bower, B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–26: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006603. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary performance assessments (PAs) have been conducted for the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico. These PAs assess the ability of the WIPP, a proposed disposal facility for defense-generated nuclear waste, to comply with EPA's requirements at 40 CFR 191. The experience in conducting PAs has provided insights into guidance that would facilitate the conduct of studies and analyses required by the regulation. Guidance topics and suggested directions are discussed for possible inclusion in EPA rulemaking for WIPP-specific compliance criteria to be found at 40 CFR 194.

11753 (SAND–93-2670C) **Dilation-induced permeability changes in rock salt.** Stormont, J.C. (Sandia National Labs., Albuquerque, NM (United States)); Fuenkajorn, K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940506–1: 8. international conference on computer methods and advances in geomechanics, Morgantown, WV (United States), 22-28 May 1994). Order Number DE94003098. Source: OSTI; NTIS; INIS; GPO Dep.

A model of permeability changes in rock salt is developed and implemented in a time-dependent finite element code. Model parameters are developed from laboratory tests. The model is used to predict permeability changes adjacent to excavations in rock salt.

11754 (SAND–93-3966C) **An approach to establishing cooperative R&D projects with Russian institutes.** Hunter, T. (Sandia National Labs., Albuquerque, NM (United States)); Albert, T.; Fryberger, T.; Romanovsky, V. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–54: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007730. Source: OSTI; NTIS; INIS; GPO Dep.

An important part of technology exchange between the US and the former Soviet Union is the identification and implementation of cooperative projects that benefit both Russia and the US. The US Department of Energy and its laboratories have established an approach to identify potential technologies that can contribute to solving US environmental problems and to establish projects for enhancing technology development. This approach consists of screening technologies for US applications, conducting small-scale pilot projects with Russian scientists to evaluate the validity of mechanisms for larger projects, helping develop direct communication between US and Russian scientists who are developing these technologies, and implementing major projects in specific technology development areas. A recent example of this approach is the initiation of projects between the Khlopin Radium Institute and DOE through Sandia National Laboratories and SAIC. This effort has resulted in not only enhanced technology for the US but has also provided an example for future cooperative projects.

11755 (SAND–93-4097C) **Appropriateness of one-dimensional calculations for repository analysis.** Eaton, R.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940553–5: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94005588. Source: OSTI; NTIS; INIS; GPO Dep.

This paper brings into focus the results of numerous studies that have addressed issues associated with the validity of assumptions which are used to justify reducing the dimensionality of numerical calculations of water flow through Yucca Mountain, NV. It is shown that in many cases, one-dimensional modeling is more rigorous than previously assumed.

11756 (SAND–94-0107C) **Thermal performance of a depleted uranium shielded storage, transportation, and disposal package.** Wix, S.D. (GRAM, Inc., Albuquerque, NM (United States)); Yoshimura, H.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940553–14: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94007729. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is responsible for management and disposal of large quantities of depleted uranium (DU) in the DOE complex. Viable economic options for the use and eventual disposal of the material are needed. One possible option is the use of DU as shielding material for vitrified Defense High-Level Waste (DHLW) storage, transportation, and disposal packages. Use of DU as a shielding material provides the potential benefit of disposing of significant quantities of DU during the DHLW storage and disposal process. Two DU package concepts have been developed by Sandia National Laboratories. The first concept is the Storage/Disposal plus Transportation (S/D+T) package. The S/D+T package consists of two major components: a storage/disposal (S/D) container and a transportation overpack. The second concept is the S/D/T package which is an integral storage, transportation, and disposal package. The package concept considered in this analysis is the S/D+T package with seven DHLW waste canisters. The SID+T package provides shielding and containment for the DHLW waste canisters. The S/D container is intended to be used as an on-site storage and repository disposal container. In this analysis, the S/D container is constructed from a combination of stainless steel and DU. Other material combinations, such as mild steel and DU, are potential candidates. The transportation overpack is used to transport the S/D containers to a final geological repository and is not included in this analysis.

11757 (SAND–94-0658C) **A strategy for analysis of TRU waste characterization needs.** Leigh, C.D. (Sandia National Labs., Albuquerque, NM (United States)); Chu, M.S.Y.; Arvizu, J.S.; Marcinkiewicz, C.J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–53: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007741. Source: OSTI; NTIS; INIS; GPO Dep.

Regulatory compliance and effective management of the nation's TRU waste requires knowledge about the constituents present in the waste. With limited resources, the DOE needs a cost-effective characterization program. In addition, the DOE needs a method for predicting the present and future analytical requirements for waste characterization. Thus, a strategy for predicting the present and future waste characterization needs that uses current knowledge of the TRU inventory and prioritization of the data needs is presented.

11758 (SAND–94-8207) **Process Waste Assessment for the Diana Laser Laboratory.** Phillips, N.M. Sandia National Labs., Livermore, CA (United States). Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94004813. Source: OSTI; NTIS; INIS; GPO Dep.

This Process Waste Assessment was conducted to evaluate the Diana Laser Laboratory, located in the Combustion Research Facility. It documents the hazardous chemical waste streams generated by the laser process and establishes a baseline for future waste minimization efforts. This Process Waste Assessment will be reevaluated in approximately 18 to 24 months, after enough time has passed to implement recommendations and to compare results with the baseline established in this assessment.

11759 (SKB-TR–93-14) **Simulation of the European ice sheet through the last glacial cycle and prediction of future glaciation.** Boulton, G.S. (Edinburgh Univ. (United Kingdom). Dept. of Geology and Geophysics, Grant Inst.); Payne, A. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Dec 1992. 150p. Order Number DE94616529. Source: OSTI; NTIS; INIS.

Global climates of the recent past appear to correlate with patterns of variation in the earths orbit round the sun. As such orbital changes can be predicted into the future, it is argued that the pattern of natural long-term future change can also be estimated. From this, future trends of glaciation can be inferred. The physical and mathematical basis of a time-dependent, thermo mechanically coupled, three dimensional ice sheet model is described. The model is driven by changes in the equilibrium line altitude (ELA) on its surface. This causes flexure of the underlying lithosphere. The model is tuned to the maximum extension of the last (Weichselian) ice sheet and driven by an ELA fluctuation which reflects the NE Atlantic sea surface temperature fluctuation pattern during the last glacial cycle in such a way that the model reproduces the ice sheet margin at the glacial maximum. The distribution of internal ice sheet velocity, temperature, basal melting rate and sub glacial permafrost penetration are all computed. The model is then tested against its predictions of the areal pattern of ice sheet expansion and decay, the pattern of crustal flexure and relative sea level change, and the distribution of till produced by the last European ice sheet. The tested model is then driven by predictions of future climate change to produce simulations of future ice sheet glaciation in northern Europe.

11760 (SKB-TR–93-18) **Solubility of the redox-sensitive radionuclides ^{99}Tc and ^{237}Np under reducing conditions in neutral to alkaline solutions. Effect of carbonate.** Eriksen, T.E. (Royal Inst. of Tech., Stockholm (Sweden). Dept. of Nuclear Chemistry); Ndalamba, P.; Cui, D.; Bruno, J.; Caceci, M.; Spahiu, K. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Sep 1993. 40p. Order Number DE94616530. Source: OSTI; NTIS; INIS.

We have studied the solubility of Tc(4) and Np(4) hydrous oxides in aqueous solution as a function of pH and carbonate concentration. The solid phases used were prepared by electro-reduction and precipitation on platinum electrodes. The implications on the speciation and mobility of Tc(4) and Np(4) in groundwater, as well as those of U(4) and Pu(4), are discussed.

11761 (SKI-TR–93-30) **SKIs evaluation of SKBs RD and D programme 92.** Swedish Nuclear Power Inspectorate, Stockholm (Sweden). Jul 1993. 237p. Order Number DE94614091. Source: OSTI; NTIS; INIS.

Section 11 of the Act (1984:3) on Nuclear Activities stipulates that the holder of a licence to own or operate a nuclear power reactor shall ensure that the necessary comprehensive research and development work is conducted in order to safely handle and

finally dispose of the nuclear waste produced and to safely decommission and dismantle installation where the nuclear activity is no longer carried out. According to section 12 of the Act on nuclear activities, the reactor owners shall, in consultation with each other, prepare or have prepared a programme for the necessary comprehensive research and development work and the other measures. The programme shall contain an overview of all measures that may be necessary and also specify, in detail, the measures that are intended to be taken within a period of at least six years. The programme shall be submitted to the Government or to the authority designated by the Government for examination and evaluation. According to section 22 of the ordinance on nuclear activities, the Swedish Nuclear Power Inspectorate (SKI) shall ensure that the research and development work which the reactor owners are responsible for undertaking according to sections 11 and 12 of the act of nuclear activities, is actually carried out. SKIs premise for evaluating the programme has been to examine it as an integrated R and D programme, which essentially focusses on structure, strategy and planning in order to effectively realize the defined goals of the programme, i.e. finding a safe, final solution to the disposal of spent nuclear fuel. Keeping to the time-schedule should not be the controlling factor in carrying out the research and development programme. The essential objective is to attain the goal without jeopardizing quality. SKIs examination has been documented in the form of the following: summary and conclusions, evaluation report, report of comments by reviewing bodies, and consultants reports. (68 refs.).

11762 (UCRL-ID–112617) **Fuzzy set classifier for waste classification tracking.** Gavel, D.T. Lawrence Livermore National Lab., CA (United States). 4 Nov 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007451. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed an expert system based on fuzzy logic theory to fuse the data from multiple sensors and make classification decisions for objects in a waste reprocessing stream. Fuzzy set theory has been applied in decision and control applications with some success, particularly by the Japanese. We have found that the fuzzy logic system is rather easy to design and train, a feature that can cut development costs considerably. With proper training, the classification accuracy is quite high. We performed several tests sorting radioactive test samples using a gamma spectrometer to compare fuzzy logic to more conventional sorting schemes.

11763 (UCRL-ID–115383) **Thermodynamic analysis of actinide volatilities for the thermal processor units in the ITTS study.** Krikorian, O.H. Lawrence Livermore National Lab., CA (United States). 7 Oct 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007763. Source: OSTI; NTIS; GPO Dep.

Available thermodynamic data for volatilization of U and Pu gaseous species under oxidizing conditions are tabulated: UO_3, $UO_2(OH)_2$, UO_2F_2, PuO_3, $PuO_2(OH)_2$. Results of a thermodynamic analysis of U, Pu, and Am volatilities in the secondary combustor, plasma arc process, and vitrifier are given.

11764 (UCRL-ID–116187) **Mixed Waste Management Facility: Monthly report summary, October–December 1993.** Streit, R. Lawrence Livermore National Lab., CA (United States). 31 Jan 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008319. Source: OSTI; NTIS; GPO Dep.

As the initial monthly report, this document will overview activities through the first three months of FY94. Subsequent reports will be based on the previous month's activities. During the first three months of FY94 the primary focus has been directed towards the Conceptual Design. The author completed a series of "Point Design" meetings leading to definition of process flow and functional flow diagrams. A formal 30% Conceptual Design Review was held in December with a panel of senior Laboratory and outside reviewers, including DOE. Although awaiting formal input from the Scientific Advisory Board, the input provided during the wrap-up session supported the Project effort in completing the CDR activities. A number of assurances milestones/markers were completed, including issuing of the Quality Assurance Plan, and initiating a contract with Roy W. Weston for the Preliminary Safety Analysis Report. In the Program Support area, a draft Project Management Plan was issued to DOE for review, and a number of key Project personnel (including Project Control Manager and Project Engineers) were selected.

11765 (UCRL-JC–114906) **Continuous Oxidation/Reduction System (CORS).** Riley, D. (Science Applications International Corp., Pleasanton, CA (United States)); Bronson, M. Lawrence Livermore National Lab., CA (United States). Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940215–6: International symposium on actinides: processing and materials, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94006723. Source: OSTI; NTIS; GPO Dep.

A Continuous Oxidation-Reduction System (CORS) is being developed at Lawrence Livermore National Laboratory (LLNL). The CORS combines reduction and oxidation reactions within a single reactor. The materials being processed are fed continuously while the products are continuously removed. The system is being developed for the continuous oxidation and/or reduction of reactive metals, salts, oxides, and other compounds. Recent feasibility tests reducing cerium oxide were successful. Two applications of this system currently being examined are: actinide oxide reduction and the separation of radionuclides from wastes and residues. In comparison to traditional processes such as fluorination/bomb reduction and Direct Oxide Reduction (DOR), CORS reduces operator radiation exposure, waste, processing time and equipment requirements. A patent has been filed for this process.

11766 (UCRL-JC–115488) **The lack of technical basis for requiring a ten thousand year prediction for nuclear waste management.** Ramspott, L.D. Lawrence Livermore National Lab., CA (United States). 10 Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–81: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006611. Source: OSTI; NTIS; INIS; GPO Dep.

There is no technical basis for setting a time limit of 10,000 years on the regulated performance of a nuclear waste repository. First, accurate prediction of releases for such periods is not possible. Second, there is nothing unique about 10,000 years. Third, equally toxic materials, which never transform to non-toxic substances by radioactive decay, have no long-term requirements. And fourth, over a 10,000 year time frame, social and natural disasters will dwarf the worst possible outcomes of repository placement. Analyses could be required to extend as long as doses above current radiation protection guidelines are possible (perhaps several million years), but these results should be recognized as qualitative information rather than evidence of quantitative compliance with exact numerical limits. Concern for what will happen over long times can be addressed for the next several hundred years by maintaining waste retrievability. At that time, uncertainty about future performance should have been reduced significantly.

11767 (USGS-OFR–93-60) **Geohydrologic data from test hole USW UZ-6s, Yucca Mountain, Nye County, Nevada.** Loskot, C.L. Geological Survey, Denver, CO (United States). 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI08-92NV10874. Order Number DE94008084. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the investigation of Yucca Mountain, Nevada, as a potential site for storing high-level radioactive wastes in an underground mined geologic repository, the US Geological Survey, in cooperation with the US Department of Energy, in 1982, began drilling a series of test holes in and near the southwestern part of the Nevada Test Site to determine the geologic and hydrologic characteristics of the area. Test hole USW UZ-6s is part of that series of test holes, and this report presents data obtained from test hole USW UZ-6s. The data includes those from drilling operations, lithology, coring, and laboratory analyses of hydrologic properties, which include gravimetric water content, water potential, and bulk- and grain-density values. The gravimetric water content of the densely welded section of the Tiva Canyon Member of the Paintbrush Tuff averages 0.027 gram per gram for test hole USW UZ-6s; water potential averages −7,200 kilo-pascals; gravimetric water content of the moderately to densely welded tuffs range from

0.054 gram per gram for the Tiva Canyon Member of the Paintbrush Tuff to 0.027 gram per gram for the Topopah Spring Member of the Paintbrush Tuff; and water potentials range from −6,700 to −3,400 kilopascals. Gravimetric water content for the partially welded to unnamed bedded tuffs average 0.123, 0.106, and 0.085 gram per gram for the Tiva Canyon Member, the unnamed bedded tuffs, and the Topopah Spring Member in test hole USW UZ-6s; average water potentials for these units are −1,700, −480, and −820 kilopascals.

11768 (WHC-SA–1985) **Corrosion monitoring of high-level waste tanks.** Anantatmula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Divine, J.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940222–8: Corrosion 94: National Association of Corrosion Engineers (NACE) international annual conference, Baltimore, MD (United States), 28 Feb - 4 mar 1994). Order Number DE94004822. Source: OSTI; NTIS; INIS; GPO Dep.

High-level nuclear wastes are currently being stored in carbon steel tanks at the Hanford Site. The wastes are stored in both single-shell tanks (SSTs) and double-shell tanks (DSTs). The SSTs have already exceeded their design life and some of these tanks have already leaked waste into the surrounding soil. The DSTs, on the other hand, were fabricated and put into operation more recently and have not been observed to show any leakage of wastes. One of the objectives at the Hanford Site is to monitor the degradation of the DSTs with the aid of in-tank corrosion probes. Outside the nuclear industry, electrochemical and resistance corrosion probes are in common use. The application of these probes to nuclear waste storage is generally complicated by the high radiation and complexed caustic environment. This paper deals with the details of a proposed development of commercial probes to monitor corrosion of the DSTs at the Hanford Site. Once the corrosion probes are successfully developed, the technology can be applied to SSTs and also transferred to other US Department of Energy (DOE) Sites.

11769 (WHC-SD-C018H-PLN–004) **Groundwater monitoring plan for the proposed state-approved land disposal structure.** Reidel, S.P. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1993. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94002495. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines a detection-level groundwater monitoring program for the state-approved land disposal structure (SALDS). The SALDS is an infiltration basin proposed for disposal of treated effluent from the 200 Areas of the Hanford Site. The purpose of this plan is to present a groundwater monitoring program that is capable of determining the impact of effluent disposal at the SALDS on the quality of groundwater in the uppermost aquifer. This groundwater monitoring plan presents an overview of the SALDS, the geology and hydrology of the area, the background and indicator evaluation (detection) groundwater monitoring program, and an outline of a groundwater quality assessment (compliance) program. This plan does not provide a plan for institutional controls to track tritium beyond the SALDS.

11770 (WHC-SD-EN-EV–026) **Results of groundwater quality assessment program at Low-Level Waste Management Area 3 of the low-level burial grounds.** Mercer, R.B. Westinghouse Hanford Co., Richland, WA (United States). 11 Jan 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007156. Source: OSTI; NTIS; INIS; GPO Dep.

Low-Level Waste Management Area 3 (LLWMA-3) is located in the 200 West Area of the Hanford Site. It is regulated under the Resource Conservation and Recovery Act (RCRA) and is currently operating under an interim status groundwater quality assessment program described in Chamness, Jensen, and Last (1990). This assessment program was initiated when well 299-W7-4 exceeded the critical mean established for Total Organic Halogen (TOX) and wells 299-W7-5 and 299-W8-1 exceeded the critical mean for Total Organic Carbon (TOC). The purpose of this report is to present the results of the assessment program. Additional upgradient monitoring wells have been installed and critical mean values for indicator parameters at LLWMA-3 must be recalculated. This assessment concludes that LLWMA-3 should return to a background evaluation program in January 1994.

11771 (WSRC-MS–93-231) **Application of accident progression event tree technology to the Savannah River Site Defense Waste Processing Facility SAR analysis.** Brandyberry, M.D. (Westinghouse Savannah River Co., Aiken, SC (United States)); Baker, W.H.; Wittman, R.S.; Amos, C.N. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940312–50: 2. Probabilistic safety assessment and management conference (PSAM), San Diego, CA (United States), 20-24 Mar 1994). Order Number DE94006385. Source: OSTI; NTIS; INIS; GPO Dep.

The Accident Analysis in the Safety Analysis Report (SAR) for the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF) has recently undergone an upgrade. Non-reactor SARs at SRS (and other Department of Energy (DOE) sites) use probabilistic techniques to assess the frequency of accidents at their facilities. This paper describes the application of an extension of the Accident Progression Event Tree (APET) approach to accidents at the SRS DWPF. The APET technique allows an integrated model of the facility risk to be developed, where previous probabilistic accident analyses have been limited to the quantification of the frequency and consequences of individual accident scenarios treated independently. Use of an APET allows a more structured approach, incorporating both the treatment of initiators that are common to more than one accident, and of accident progression at the facility.

11772 (WSRC-MS–93-317) **An innovative method for mixed waste disposal at the Savannah River Site's high level liquid waste tank farms.** Gaughan, T.P.; Taylor, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940211–2: 27. midyear topical meeting of the Health Physics Society: managing radioactive and mixed waste, Albany, NY (United States), 13-17 Feb 1994). Order Number DE94006671. Source: OSTI; NTIS; INIS; GPO Dep.

The In-Tank Precipitation (ITP) facility located at the U.S. Department of Energy's Savannah River Site (SRS) in Aiken, SC is responsible for the primary decontamination of high level radioactive liquid waste generated from reactor operations. Treatment of this waste at the ITP facility requires the use of specially designed cross flow sintered metal filters which physically separate the waste into a high activity precipitate and a decontaminated salt solution. In processing the waste the filters are expected to eventually become fouled and plugged with solids material requiring the filters' removal and replacement. Disposal of these fouled filters is complicated in that the solids material plugging the filters contains hazardous constituents as defined by the Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act (RCRA). The filters will therefore be prohibited from land disposal options unless treated to the appropriate Land Disposal Restriction (LDR) standard. Personnel at SRS have developed a unique treatment and disposal alternative which includes macro-encapsulation, off-gas treatment and the appropriate radiation shielding. SRS has obtained EPA agreement with this new process in the form of an approved "Treatability Variance" from the LDR regulations.

11773 (WSRC-MS–93-380) **Decontamination and treatment of high level liquid mixed waste to meet regulatory compliance issues outlined in Federal Facilities Agreements.** Gaughan, T.P.; Taylor, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940225–46: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007283. Source: OSTI; NTIS; INIS; GPO Dep.

High-Level Radioactive Liquid waste is stored in underground storage tanks at the US Department of Energy's Savannah River Site (SRS) located south of Aiken, SC. Treatment and disposal of this liquid Hazardous and Radioactive (Mixed) Waste required the negotiation and approval of a Federal Facility Agreement (FFA) between the DOE, EPA and the South Carolina state regulatory

agency. This agreement which also addresses many other waste sites at SRS was approved in January 1993. Included in this FFA were schedule information, operating parameters and secondary containment requirements that the DOE committed to as part of an ongoing Environmental Restoration mission at the site. Obtaining compliance with this FFA and other environmental regulations at such a unique facility provided a challenging obstacle for treatment of this liquid waste.

11774 (WSRC-MS–93-405) **Sampling the contents of High-Level Waste tanks.** Gray, P.L.; Skidmore, V.L.; Bragg, T.K.; Kerrigan, T. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940225–14: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006390. Source: OSTI; NTIS; INIS; GPO Dep.

Samples were recently retrieved from a HLW storage tank at the DOE Savannah River Site using simple tools developed for this task. The tools are inexpensive and manually operated, require brief tank open times, and minimize radiation doses.

11775 (WSRC-MS–93-482) **An integrated degradation and structural model for predicting the service life of buried reinforced concrete structures for low- and intermediate-level radioactive waste disposal.** Brandstetter, E.R. (INTERA, Inc. (United States)); Lolcama, J.L.; Reed, S.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940225–45: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007285. Source: OSTI; NTIS; INIS; GPO Dep.

The primary focus of this study was to determine the possible rates of roof and wall failure and the times to structural collapse of the roof and walls of three vault designs at the Department of Energy's Savannah River Site near Aiken, South Carolina. Failure was defined as a loss of ability to divert soil water around the vault. Collapse was defined as the total loss of structure integrity of the vault. Failure and eventual collapse of the three vault types results from concrete deterioration under stress, in the presence of corrosive soil water. Degradation rates for reinforced concrete were utilized, and the resultant changes in properties (such as strength, thickness, cracking and hydraulic conductivity) were evaluated. Baseline times to failure and collapse of the walls and roof components were modeled, and sensitivity analyses were conducted to provide boundaries on these estimated times. Thus, the goal of the project was to provide a bounding analysis of the time to roof and wall failure and potential collapse, rather than an actual prediction of the time to failure, and collapse.

11776 (WSRC-MS–93-491) **High level radioactive waste management facility design criteria.** Sheikh, N.A.; Salaymeh, S.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940553–1: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE94001750. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the engineering systems for the structural design of the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS). At the DWPF, high level radioactive liquids will be mixed with glass particles and heated in a melter. This molten glass will then be poured into stainless steel canisters where it will harden. This process will transform the high level waste into a more stable, manageable substance. This paper discuss the structural design requirements for this unique one of a kind facility. A special emphasis will be concentrated on the design criteria pertaining to earthquake, wind and tornado, and flooding.

11777 (WSRC-MS–93-550) **An investigation of the radiolytic stability of a resorcinol- formaldehyde ion exchange resin.** Crawford, C.L.; Bibler, N.E.; Bibler, J.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940225–67: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007971. Source: OSTI; NTIS; GPO Dep.

Radiolytic stability of a resorcinol-formaldehyde polycondensation-type cation exchange resin was investigated for up to IE09 rads total dose. The resorcinol-formaldehyde resin is a resin that has potential cesium decontamination applications at Pacific Northwest and Savannah River. We have determined both radiation and storage effects on performance of the resin using 101-AW Hanford simulant and ASTM Type-I water. Distribution coefficient determinations, total carbon analysis, and physical observations lead us to conclude that radiation up to IE08 rads does not significantly affect the performance of the resin. The resin is more stable to radiation in water than in 101-AW Hanford simulant. Also radiation or storage does not affect the thermal stability of the resin. Gas production rates for several resin slurries increased in the order of resin/101-AW Hanford simulant, resin/ASTM water, and resin/0.5 M HNO_3. H_2 is produced from radiolysis of resin in 101-AW Hanford simulant with a G value of $G(H_2)$ of 0.11 ± 0.02 molecules/100eV and in 0.5 M HNO_3 with a G value of $G(H_2)$ of 0.27 ± 0.02 molecules/lOOeV.

11778 (WSRC-MS–93-582) **Use of a comprehensive calibration "gauntlet" approach for improved contaminants transport modeling at the F and H Area Seepage Basins.** Looney, B.B. (Westinghouse Savannah River Co., Aiken, SC (United States)); Haselow, J.S.; Pidcoe, W.W.; Lewis, C.M.; Andersen, P.F.; Spalding, C.P. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 13p. DOE Contract AC09-89SR18035. Order Number DE94004429. Source: OSTI; NTIS; INIS; GPO Dep.

Many types of facility and monitoring data have been collected to support operation, closure and envirorunental restoration of the F and H-Area Seepage Basins at the Savannah River Site. Based on the various types of data, we developed contaminant transpose models to allow projection of contaminant releases and comparison of restoration alternatives. The modeling was performed in the following three stages: postulation of a conceptual model of the flow and transport system; development of a simplified analytical model based on a transfer function; development of a numerical model. A key feature of the work was use of both traditional data sources and calibration targets such as heads, geological data and pump test results, and non-traditional data sources and calibration targets, such as plume arrival times and shapes, contaminant release rates, and surface water concentrations. Throughout the process, the intermediate and final results were compared to all of the various data types and the earlier modeling stages. The result was a calibration "gauntlet" with explicit criteria for refinement and acceptance of the final model. Failure to match at any step within the gauntlet necessitated appropriate reformulation or modification of the model and rechecking for acceptable matches.

11779 (WSRC-MS–93-606) **Dynamic simulation of the in-tank precipitation process.** Hang, T.; Shanahan, K.L.; Gregory, M.V.; Walker, D.D. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940456–8: 1994 Society for Computer Simulation multiconference, San Diego, CA (United States), 11-15 Apr 1994). Order Number DE94006384. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the High-Level Waste Tank Farm at the Savannah River Site (SRS), the In-Tank Precipitation (ITP) facility was designed to decontaminate the radioactive waste supernate by removing cesium as precipitated cesium tetraphenylborate. A dynamic computer model of the ITP process was developed using SPEEDUP™ software to provide guidance in the areas of operation and production forecast, production scheduling, safety, air emission, and process improvements. The model performs material balance calculations in all phase (solid, liquid, and gas) for 50 key chemical constituents to account for inventory accumulation, depletion, and dilution. Calculations include precipitation, benzene radiolytic reactions, evaporation, dissolution, adsorption, filtration, and stripping. To control the ITP batch operation a customized FORTRAN program was generated and linked to SPEEDUP™ simulation This paper summarizes the model development and initial results of the simulation study.

11780 (WSRC-RP–93-997) **Potential for a solids fire during an ITP waste tank deflagration and the impact on gas pressure.** Thomas, J.K. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94003698. Source: OSTI; NTIS; INIS; GPO Dep.

During the In-Tank Precipitation (ITP) process, solid deposits may form at the water-line on internal waste tank surfaces. These solids may be combustible due to the presence of tetraphenylborate compounds and hence there is a potential that a waste tank deflagration could ignite a solids fire. The work described in this report evaluates the potential for a waste tank deflagration to ignite a solids fire and the subsequent effect on gas pressure. Thermal analyses were performed using a one-dimensional conduction model, radiative heat flux values calculated with the Deflagration Pressure Analysis Code (DPAC), and effective deposit properties calculated from the component properties. It was shown that a solids fire could only be ignited by a waste tank deflagration for a limited range of cases. For the best-estimate mixtures, a solids fire could not be ignited prior to the time the peak gas pressure is reached and would not increase the peak pressure. For the upper-bound mixtures, the thickness of the solid layer which could be ignited is insufficient to increase the energy released by the deflagration by a significant amount. It was also shown that these conclusions are relatively insensitive to uncertainties related to deposit composition. Thus, the contribution from a solids fire to the gas pressure resulting from a waste tank deflagration may be neglected.

11781 (WSRC-RP–93-1039) **Nitric acid flowsheet with late wash PHA testing: Task Technical Plan, Integrated DWPF Melter System.** Zamecnik, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). 28 Oct 1993. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007181. Source: OSTI; NTIS; INIS; GPO Dep.

This Task Technical Plan outlines the activities to be conducted in the Integrated DWPF Melter System (IDMS) in ongoing support of the Defense Waste Processing Facility (DWPF) Chemical Process Cell (CPC) utilizing the Nitric Acid Flowsheet in the Sludge Receipt and Adjustment Tank (SRAT) and Precipitate Hydrolysis Aqueous (PHA) produced by the Late Wash Flowsheet. The IDMS facility is to be operated over a series of runs (2 to 4) using the Nitric Acid Flowsheet. The PHA will be produced with the Late Wash Flowsheet in the Precipitate Hydrolysis Experimental Facility (PHEF). All operating conditions shall simulate the expected DWPF operating conditions as closely as possible. The task objectives are to perform at least two IDMS runs with as many operating conditions as possible at nominal DWPF conditions. The major purposes of these runs are twofold: verify that the combined Late Wash and Nitric Acid flowsheets produce glass of acceptable quality without additional changes to process equipment, and determine the reproducibility of data from run to run. These runs at nominal conditions will be compared to previous runs made with PHA produced from the Late Wash flowsheet and with the Nitric Acid flowsheet in the SRAT (Purex 4 and Purex 5).

11782 (WSRC-RP–93-1271-TL) **MFT homogeneity study at TNX: Final report on the low weight percent solids concentration.** Jenkins, W.J. Westinghouse Savannah River Co., Aiken, SC (United States). 21 Sep 1993. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94004434. Source: OSTI; NTIS; INIS; GPO Dep.

A statistical design and analysis of both elemental analyses and weight percent solids analyses data was utilized to evaluate the MFT homogeneity at low heel levels and low agitator speed at both high and low solids feed concentrations. The homogeneity was also evaluated at both low and high agitator speed at the 6000+ gallons static level. The dynamic level portion of the test simulated feeding the Melter from the MFT to evaluate the uniformity of the solids slurry composition (Frit-PHA-Sludge) entering the melter from the MFT. This final report provides the results and conclusions from the second half of the study, the low weight percent solids concentration portion, as well as a comparison with the results from the first half of the study, the high weight percent solids portion.

11783 (WSRC-RP–93-1318) **Modeling uranium solubility in aged vault disposal.** Orebaugh, E.G. Westinghouse Savannah River Co., Aiken, SC (United States). 9 Sep 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94003707. Source: OSTI; NTIS; INIS; GPO Dep.

Using Version 3.0 of the ESP software from OLI Systems containing thermo dynamic data for uranium in the expanded data base, the author has modeled the uranium solubility with the highest degree of accuracy available considering the limitations of the model.

11784 (WSRC-RP–93-1319) **Filming in decontamination by mopping.** Rankin, W.N.; Toole, P.A. Westinghouse Savannah River Co., Aiken, SC (United States). 28 Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94003706. Source: OSTI; NTIS; INIS; GPO Dep.

Technical assistance was provided High Level Waste Engineering in the investigation and prevention of filming during decontamination by mopping. After mopping operations in a Tank Farm application, a film of the cleaning agent sometimes remained on the surface being cleaned which interfered with monitoring to detect the presence of radioactive material. Scoping tests were conducted to investigate filming characteristics of two cleaning materials. In addition, rinsing test were conducted to demonstrate how filming can be prevented.

11785 (WSRC-RP–93-1604) **Interim report on testing of off-gas treatment technologies for abatement of atmospheric emissions of chlorinated volatile organic compounds.** Haselow, J.S.; Jarosch, T.R.; Rossabi, J.; Burdick, S.; Lombard, K. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007969. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to briefly summarize the results to date of the off-gas treatment program for atmospheric emissions of chlorinated volatile organic compounds (CVOCs), in particular trichloroethylene (TCE) and perchloroethylene (PCE). This program is part of the Department of Energy's Office of Technology Development's Integrated Demonstration for Treatment of Organics in Soil and Water at a Non-Arid Site. The off-gas treatment program was initiated after testing of in-situ air stripping with horizontal wells was completed. That successful test expectedly produced atmospheric emissions of CVOCs that were unabated. It was decided after that test that an off-gas treatment program would complement the Integrated Demonstration not only because off-gas treatment is an integral portion of remediation of CVOC contamination in groundwater and soil but also because several technologies were being developed across the US to mitigate CVOC emissions. A single platform for testing off-gas treatment technologies would facilitate systematic and unbiased evaluation of the emerging technologies.

11786 (WSRC-TR–92-142-Rev.1) **Characterization of projected DWPF glasses heat treated to simulate canister centerline cooling: Revision 1.** Marra, S.L.; Jantzen, C.M. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007281. Source: OSTI; NTIS; INIS; GPO Dep.

Liquid high-level nuclear waste will be immobilized at the Savannah River Site (SRS) by vitrification in borosilicate glass. The glass will be produced and poured into stainless steel canisters in the Defense Waste Processing Facility (DWPF). Eventually these canistered waste forms will be sent to a geologic repository for final disposal. In order to assure acceptability by the repository, the Department of Energy has defined requirements which DWPF canistered waste forms must meet. These requirements are the Waste Acceptance Product Specifications (WAPS). The WAPS require DWPF to identify the crystalline phases expected to be present in the final glass product. Knowledge of the thermal history of the borosilicate glass during filling and cooldown of the canister is necessary to determine the amount and type of crystalline phases present in the final glass product. Glass samples of seven projected DWPF compositions were cooled following the same

temperature profile as that of glass at the centerline of the full scale DWPF canister. The glasses were characterized by X-ray diffraction and scanning electron microscopy to identify the crystalline phases present. The volume percents of each crystalline phase present were determined by quantitative x-ray diffraction. The Product Consistency Test (PCT) was used to determine the durability of the heat treated glasses.

11787 (WSRC-TR–93-414) **Production and remediation of low sludge simulated Purex waste glasses, 2: Effects of sludge oxide additions on glass durability.** Ramsey, W.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940551–1: American Ceramic Society (ACS) annual meeting, Indianapolis, IN (United States), May 1994). Order Number DE94001197. Source: OSTI; NTIS; INIS; GPO Dep.

Glass produced during the Purex 4 campaigns of the Integrated DWPF Melter System (IDMS) and the 774 Research Melter contained a lower fraction of sludge components than targeted by the Product Composition Control System (PCCS). Purex 4 glass was more durable than the benchmark (EA) glass, but was less durable than most other simulated SRS high-level waste glasses. Further, the measured durability of Purex 4 glass was not as well correlated with the durability predicted from the DWPF process control algorithm, probably because the algorithm was developed to predict the durability of SRS high-level waste glasses with higher sludge content than Purex 4. A melter run, designated Purex 4 Remediation, was performed using the 774 Research Melter to determine if the initial PCCS target composition determined for Purex 4 would produce acceptable glass whose durability could be accurately modeled by the DWPF glass durability algorithm. Reagent grade oxides and carbonates were added to Purex 4 melter feed stock to simulate a higher sludge loading. Each canister of glass produced was sampled and the glass durability was determined by the Product Consistency Test method. This document details the durability data and subsequent analysis.

11788 (WSRC-TR–93-468) **Pilot scale benzene stripping column testing: Review of test data and application to the ITP columns.** Georgeton, G.K.; Gaughan, T.P.; Taylor, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). 10 Sep 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007966. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive cesium will be removed from aqueous high level waste (HLW) solutions by precipitation with sodium tetraphenyl borate (TPB) in the In-Tank Precipitation (ITP) process. Benzene is generated due to the radiolysis of TPB, and dissolves into the decontaminated salt solution (DSS) and into the water used to wash (WW) the precipitate. These solutions will be processed through stripping columns to reduce the benzene concentration to satisfy limits for disposal of the DSS and for temporary storage of the WW. A pilot scale testing program to evaluate the stripping column operation in support of ITP startup activities has been completed. Equipment and test plans were developed so that data obtained from the pilot scale testing would be directly applicable to full scale column operation and could be used to project hydraulic performance and stripping efficiency of both columns. A review of the test data indicate that the ITP stripping columns will be capable of reducing benzene concentrations in salt solutions to satisfy Saltstone and Tank 22 acceptance limits. An antifoam (AF) will be required to maintain the column differential pressure below the vendor recommendation of 40 inches wc so that design feed rates can be achieved. Additionally, the testing program indicated that the nitrogen rate can be decreased from the ITP column design rates and still satisfy benzene concentration requirements in the product.

11789 (WSRC-TR–93-528) **Heat transfer modelling of the saltstone pouring and curing process: Task Number: 93-016-0.** Shadday, M.A. Jr. Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1993. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94006646. Source: OSTI; NTIS; GPO Dep.

A byproduct of the in tank precipitation, ITP, process will be 25 million gallons of low-level salt solution. This salt solution will be mixed with cement and a flyash/slag mixture and solidified in surface vaults in the Z-area Saltstone Facility. The curing process of saltstone involves exothermic reactions, and there is a maximum temperature limit of 90°C for the curing saltstone. If this temperature limit is exceeded, the physical properties of the saltstone can be degraded. A heat transfer model of the saltstone pouring and curing process has been developed that predicts transient temperature distributions in the curing saltstone. The purpose of this model is to predict peak temperatures as functions of the several independent variables in this process: pour temperature, the pour schedule, and seasonal variations in the ambient temperature. The peak temperature of the saltstone is very sensitive to the internal heat generation that accompanies the curing process. Most of the energy is released over a short period of several hours, and the balance is released slowly over a period of time that can be in excess of a month. This long term low level internal heat generation is difficult to measure in laboratory calorimetry tests, and it can significantly influence the peak temperature in the saltstone. Due to the low thermal conductivity of the saltstone, the central region of the poured saltstone will essentially heat up adiabatically. The time dependence of the internal heat generation rate was determined from an analysis of the 1991 pilot pour test. With a pour schedule of eight hours a day and five days a week in the summer, the model predicts that the saltstone will have a peak temperature of 98 C with a pour temperature of 45 C, and a peak temperature of 88 C with a pour temperature of 30 C. With a pour schedule of three days a week, the peak temperature will be 88°C with a pour temperature of 45 C, and 80 C with a pour temperature of 30 C.

11790 (WSRC-TR–93-681) **Consolidated incineration facility technical support.** Burns, D.; Looper, M.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940225–28: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006670. Source: OSTI; NTIS; INIS; GPO Dep.

In 1996, the Savannah River Site plans to begin operation of the Consolidated Incineration Facility (CIF) to treat solid and liquid RCRA hazardous and mixed wastes. The Savannah River Technology Center (SRTC) leads an extensive technical support program designed to obtain incinerator and air pollution control equipment performance data to support facility start-up and operation. Key components of this technical support program include recently completed waste burn tests at both EPA's Incineration Research Facility and at Energy and Environmental Research Corporation's Solid Waste Incineration Test Facility. The main objectives for these tests were determining the fate of heavy metals, measuring organics destruction and removal efficiencies, and quantifying incinerator offgas particulate loading and size distribution as a function of waste feed characteristics and incineration conditions. In addition to these waste burning tests, the SRTC has recently completed installations of the Offgas Components Test Facility (OCTF), a 1/10 scale CIF offgas system pilot plant. This pilot facility will be used to demonstrate system operability and maintainability, evaluate and optimize equipment and instrument performance, and provide direct CIF start-up support. Technical support programs of this type are needed to resolve technical issues related with treatment and disposal of combustible hazardous, mixed, and low-level radioactive waste. Implementation of this program will minimize facility start-up problems and help insure compliance with all facility performance requirements.

11791 (WSRC-TR–93-761) **A visual assessment of the concrete vaults which surround underground waste storage tanks.** Wiersma, B.J.; Shurrab, M.S. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007180. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste produced at the Savannah River Site (SRS) is stored in underground tanks. There are four different waste tank designs. For each waste tank design the outermost containment shield between the waste and the soil is a concrete vault surrounding the carbon steel liner(s). Should the primary and/or secondary liner be breached, the concrete vault would slow transport of the waste so that contamination of the soil is minimized. The type 3

waste tanks have a stated design life of 40–60 years. With the uncertainty of the schedule for transfer of the waste to the Defense Waste Processing Facility, it is conceivable that the tanks will be required to function past their design life. The Department of Energy formed a Waste Tank Structural Integrity Panel to investigate the potential for aging and degradation of underground radioactive waste storage tanks employed in the weapons complex. The panel is focusing on how each site in the complex: (1) inspects the waste tanks for degradation, (2) understands the potential degradation mechanisms which may occur at their sites, and (3) mitigates the known potential degradation mechanisms. In addition to the carbon steel liners, the degradation of the concrete vault has also been addressed by the panel. High Level Waste Engineering (HLWE) at SRS has formed a task team to identify key issues that determine and/or effect the condition of the concrete. In June 1993, slides were reviewed which showed the inside of the concrete vault in Type 1, 2, and 4 tanks. The authors subsequently visited the tank farm and assessed the visible portions of the outer concrete vault. Later a team of engineers knowledgeable in concrete degradation performed a walk-down. Photographs showing the concrete condition were taken at this time. This report summarizes the findings of these walk-downs and reinforces previous recommendations.

11792 (Y/EN–4787) **Design criteria Drain Rerouting Project 93-OR-EW-2.** Oak Ridge Y-12 Plant, TN (United States). Apr 1993. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94003351. Source: OSTI; NTIS; GPO Dep.

Enineering drawings for this project are identified as CAPE-3072. Inquiries may be directed to: Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831.

This document contains the design criteria to be used by the architect-engineer (A–E) in the performance of Title I and II design for the Drain Rerouting Project. The Drain Rerouting project at the US Department of Energy's (DOE) Oak Ridge Reservation in Oak Ridge, Tennessee will provide the Y-12 Plant with the capability to reroute particular drains within buildings 9202, 9203 and 9995. Process drains that are presently connected to the storm sewer shall be routed to the sanitary sewer to ensure that any objectionable material inadvertently discharged into process drains will not discharge to East Fork Popular Creek (EFPC) without treatment. The project will also facilitate compliance with the Y-12 Plant's National Pollutant Discharge Elimination System (NPDES) discharge permit and allow for future pretreatment of once-through coolant.

11793 (Y/SUB–92-YP507C/2/P1) **Groundwater quality assessment for the Upper East Fork Poplar Creek Hydrogeologic Regime at the Y-12 Plant: 1991 groundwater quality data and calculated rate of contaminant migration.** HSW Environmental Consultants, Inc., Oak Ridge, TN (United States); Oak Ridge Y-12 Plant, TN (United States). Feb 1992. 414p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94002582. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains groundwater quality data obtained during the 1991 calendar year at several waste management facilities and petroleum fuel underground storage tank (UST) sites associated with the Y-12 Plant. These sites are within the Upper East Fork Poplar Creek Hydrogeologic Regime (UEFPCHR), which is one of three regimes defined for the purposes of groundwater and surface-water quality monitoring and remediation. This report was prepared for informational purposes. Included are the analytical data for groundwater samples collected from selected monitoring wells during 1991 and the results for quality assurance/quality control (QA/QC) samples associated with each groundwater sample. This report also contains summaries of selected data, including ion-charge balances for each groundwater sample, a summary of analytical results for nitrate (a principle contaminant in the UEFPCHR), results of volatile organic compounds (VOCs) analyses validated using the associated QA/QC sample data, a summary of trace metal concentrations which exceeded drinking-water standards, and a summary of radiochemical analyses and associated counting errors.

11794 (Y/TS–1015) **Resource conversation and recovery act (RCRA) Contingency Plan for interim status or permitted units at the Oak Ridge Y-12 Plant.** Oak Ridge Y-12 Plant, TN (United States). Aug 1992. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE94002750. Source: OSTI; NTIS; INIS; GPO Dep.

The official mission of the Y-12 Plant is to serve as a manufacturing technology center for key processes such that capabilities are maintained for safe, secure, reliable, and survivable nuclear weapons systems and other applications of national importance. The Y-12 RCRA Contingency Plan will be reviewed and revised if necessary if the facility RCRA operating permits are revised, the plan is inadequate in an emergency, the procedures herein can be improved, the facility's operations change in a manner that alters the plan, the emergency coordinator changes, or the emergency equipment list changes. Copies of the Y-12 Emergency Management Plan are available at the Plant Shift Superintendent's Office and the Emergency Preparedness Office. This document serves to supplement the Y-12 Emergency Management Plan to be appropriate for all RCRA hazardous waste interim status or permitted treatment, storage, or disposal facilities. The 90-day storage areas at the Y-12 Plant have a separate contingency supplement as required by RCRA and are separate from this supplement.

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Refer also to citation(s) 11609, 11664, 11665, 11670, 11684, 11686, 11689, 11692, 11693, 11694, 11696, 11715, 11731, 11732, 11741, 11769, 11778, 11785, 11788, 11793, 11816, 11826, 11833, 11837, 11839, 11869, 12192, 12311, 13034, 13061, 13075, 13114, 13124, 13331, 13332, 13333, 13334, 13335, 13336, 13337, 13338

11795 (ANL/CMT/CP–80861) **Soil decontamination using aqueous biphasic separation.** Chaiko, D.J.; Mensah-Biney, R.; Gupta, D. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–25: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006830. Source: OSTI; NTIS; GPO Dep.

This paper summarizes efforts to develop a biphasic extraction process for separating ultrafine particulate contaminants from soils having high amounts of silt and clay. This work has thus far dealt with the removal of refractory uranium particles from the soils at Fernald, Ohio. The separation process involves the selective partitioning of ultra-fine particles between two immiscible aqueous phases. The authors have conducted batch extraction studies and are now beginning to scaleup the process for pilot-plant testing at Argonne National Laboratory (ANL). The results of these extraction studies are discussed.

11796 (ARH–2036) **Radioactivity discharged in gaseous wastes from separations facilities 200 Area stacks during 1970.** Maxfield, H.L. Atlantic Richfield Hanford Co., Richland, WA (United States). 29 Mar 1971. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007818. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document summarizes by stack number the amount of radioactivity discharged from the facilities of Chemical Processing Division, Atlantic Richfield Hanford Company. Emission data for 231-Z Building and 2724-W, Laundry Building, which are operated by other AEC Contractors are not available for this report. Total beta, alpha and $I^{[3]}$ radioactive emissions from the stacks for 1970 were as follows: alpha (Pu, assumed) 1.59×10^{-1} C, alpha (U, assumed) 1.44×10^{-3} C, beta 1.93C, and I^{131} 4.92×10^{-1} C. Air samples taken continuously from gaseous release facilities were analyzed for total beta and alpha activity (and iodine activity, where applicable). Where sample data were not available, the total radioactive emission was adjusted by using the average emission rate prior to the subject period; or where activity was near constant, by using the daily average as a base. A gamma scan of the 291-S stack is included in the report.

11797 (ARH-CD–962) **Purex process engineering study: Purex aqueous discharge.** Engelhardt, K.L. Atlantic Richfield Hanford Co., Richland, WA (United States). 6 May 1977. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007819. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Effective control and monitoring of the Purex aqueous discharges are an extremely important phase of plant operation. Protection of the surrounding environment from radioactive contamination has to be of paramount importance. All possible safety measures need to be utilized and systems in place which provide effective treatment, isolation and monitoring of the discharged streams. Continual evaluation of the discharge systems is necessary to insure effective treatment and control utilizing technically up-to-date methods that will insure minimal contamination release. Presented herein is an evaluation of Purex aqueous discharge treatment, control and monitoring capabilities and comparison with ERDA Manual Chapter 0511, 0513 and 0524 requirements. Where applicable, recommendations are submitted to accomplish those requirements.

11798 (DOE/FTR–94000752) **Travel to the United Kingdom to contribute to organizing International Symposium on Subsurface Microbiology (ISSM-93): Foreign trip report, June 29, 1993–July 21, 1993.** USDOE, Washington, DC (United States). 21 Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94000752. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Travel to the United Kingdom between June 29, 1993 and July 22, 1993, including meetings and field site visits related to DOE basic research, and planning for international meeting in subsurface microbiology. ISSM-93 is an international scientific meeting on subsurface microbiology that is cosponsored by DOE and various European groups. The traveler participated in planning meetings to finalize the scientific agenda, and to design field trips where his scientific expertise could make special contributions. The goals were to participate in the final planning meeting for a major international conference on subsurface microbiology (ISSM-93) to be held September 19–24, 1993; and, to evaluate the feasibility of aseptic, geomicrobiology sampling during the developmental stages of the British nuclear waste repository at Sellafield, in consultation with British research scientists.

11799 (DOE/NV/10630–63) **CASCADER: An M-chain gas-phase radionuclide transport and fate model: Volume 4 – Users guide to CASCADR9.** Cawlfield, D.E.; Emer, D.F.; Lindstrom, F.T.; Shott, G.J. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Waste Operations Dept. Sep 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-89NV10630. Order Number DE94007960. Source: OSTI; NTIS; GPO Dep.

Chemicals and radionuclides move either in the gas-phase, liquid-phase, or both phases in soils. They may be acted upon by either biological or abiotic processes through advection and/or dispersion. Additionally during the transport of parent and daughter radionuclides in soil, radionuclide decay may occur. This version of CASCADER called CASCADR9 starts with the concepts presented in volumes one and three of this series. For a proper understanding of how the model works, the reader should read volume one first. Also presented in this volume is a set of realistic scenarios for buried sources of radon gas, and the input and output file structure for CASCADER9.

11800 (DOE/NV/10845–37) **Archaeological investigations at a toolstone source area and temporary camp: Sample Unit 19-25, Nevada Test Site, Nye County, Nevada: Technical report No. 77.** Jones, R.C.; DuBarton, A.; Edwards, S.; Pippin, L.C.; Beck, C.M. Nevada Univ., Reno, NV (United States). Desert Research Inst. 1993. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE94006799. Source: OSTI; NTIS; GPO Dep.

Archaeological investigations were initiated at Sample Unit 19–25 to retrieve information concerning settlement and subsistence data on the aboriginal hunter and gatherers in the area. Studies included collection and mapping of 35.4 acres at site 26NY1408 and excavation and mapping of 0.02 acres at site 26NY7847. Cultural resources include two rock and brush structures and associated caches and a large lithic toolstone source area and lithic artifact scatter. Temporally diagnostic artifacts indicate periodic use throughout the last 12,000 years; however dates associated with projectile points indicate most use was in the Middle and Late Archaic. Radiocarbon dates from the rock and brush structures at site 26NY7847 indicate a construction date of A.D. 1640 and repair between A.D. 1800 and 1950 for feature 1 and between A.D. 1330 and 1390 and repair at A.D. 1410 for feature 2. The dates associated with feature 2 place its construction significantly earlier than similar structures found elsewhere on Pahute Mesa. Activity areas appear to reflect temporary use of the area for procurement of available lithic and faunal resources and the manufacture of tools.

11801 (DOE/OR/21981–T3-Vol.2-Pt.A) **Oak Ridge Health Studies Phase 1 report, Volume 2: Part A, Dose Reconstruction Feasibility Study: Tasks 1 and 2, A summary of historical activities on the Oak Ridge Reservation with emphasis on information concerning off-site emissions of hazardous materials.** Bruce, G.M.; Buddenbaum, J.E.; Lamb, J.K.; Widner, T.E. ChemRisk, Alameda, CA (United States). Sep 1993. 484p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007049. Source: OSTI; NTIS; INIS; GPO Dep.

The Phase I feasibility study has focused on determining the availability of information for estimating exposures of the public to chemicals and radionuclides released as a result of historical operation of the facilities at the Oak Ridge Reservation (ORR). The estimation of such past exposures is frequently called dose reconstruction. The initial project tasks, Tasks 1 and 2 were designed to identify and collect information that documents the history of activities at the ORR that resulted in the release of contamination and to characterize the availability of data that could be used to estimate the magnitude of the contaminant releases or public exposures. A history of operations that are likely to have generated off-site releases has been documented as a result of Task 1 activities. The activities required to perform this task involved the extensive review of historical operation records and interviews with present and past employees as well as other knowledgeable individuals. The investigation process is documented in this report. The Task 1 investigations have led to the documentation of an overview of the activities that have taken place at each of the major complexes, including routine operations, waste management practices, special projects, and accidents and incidents. Historical activities that appear to warrant the highest priority in any further investigations were identified based on their likely association with off-site emissions of hazardous materials as indicated by the documentation reviewed or information obtained in interviews.

11802 (DOE/OR/21981–T3-Vol.2-Pt.D) **Oak Ridge Health Studies Phase 1 report, Volume 2: Part D, Dose Reconstruction Feasibility Study: Tasks 6, Hazard summaries for important materials at the Oak Ridge Reservation.** Bruce, G.M.; Walker, L.B.; Widner, T.E. ChemRisk, Alameda, CA (United States). Sep 1993. 193p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007052. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of Task 6 of Oak Ridge Phase I Health Studies is to provide summaries of current knowledge of toxic and hazardous properties of materials that are important for the Oak Ridge Reservation. The information gathered in the course of Task 6 investigations will support the task of focussing any future health studies efforts on those operations and emissions which have likely been most significant in terms of off-site health risk. The information gathered in Task 6 efforts will likely also be of value to individuals evaluating the feasibility of additional health,study efforts (such as epidemiological investigations) in the Oak Ridge area and as a resource for citizens seeking information on historical emissions.

11803 (DOE/RL–93-23) **N Springs expedited response action proposal.** USDOE Richland Operations Office, WA (United States). Jan 1994. 185p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007158. Source: OSTI; NTIS; INIS; GPO Dep.

Since signing the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) in 1989, the parties to the agreement have recognized the need to modify the approach to conducting investigations, studies, and cleanup actions at Hanford. To implement this approach, the parties have jointly developed the Hanford Past-Practice Strategy. The strategy defines a non-time-critical expedited response action (ERA) as a response action "needed to abate a threat to human health or welfare or the environment where sufficient time exists for formal planning prior to

initiation of response. In accordance with the past-practice strategy, DOE proposes to conduct an ERA at the N Springs, located in the Hanford 100 N Area, to substantially reduce the strontium-90 transport into the river through the groundwater pathway. The purpose of this ERA proposal is to provide sufficient information to select a preferred alternative at N Springs. The nature of an ERA requires that alternatives developed for the ERA be field ready; therefore, all the technologies proposed for the ERA should be capable of addressing the circumstances at N Springs. A comparison of these alternatives is made based on protectiveness, cost, technical feasibility, and institutional considerations to arrive at a preferred alternative. Following the selection of an alternative, a design phase will be conducted; the design phase will include a detailed look at design parameters, performance specifications, and costs of the selected alternative. Testing will be conducted as required to generate design data.

11804 (DOE/RL–93-0047) **North Slope (Wahluke Slope) expedited response action cleanup plan.** USDOE Richland Operations Office, WA (United States). Feb 1994. 217p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007422. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this action is to mitigate any threat to public health and the environment from hazards on the North Slope and meet the expedited response action (ERA) objective of cleanup to a degree requiring no further action. The ERA may be the final remediation of the 100-I-3 Operable Unit. A No Action record of decision (ROD) may be issued after remediation completion. The US Department of Energy (DOE) currently owns or administers approximately 140 mi^2 (about 90,000 acres) of land north and east of the Columbia River (referred to as the North Slope) that is part of the Hanford Site. The North Slope, also commonly known as the Wahluke Slope, was not used for plutonium production or support facilities; it was used for military air defense of the Hanford Site and vicinity. The North Slope contained seven antiaircraft gun emplacements and three Nike-Ajax missile positions. These military positions were vacated in 1960–1961 as the defense requirements at Hanford changed. They were demolished in 1974. Prior to government control in 1943, the North Slope was homesteaded. Since the initiation of this ERA in the summer of 1992, DOE signed the modified Hanford Federal Agreement and Consent Order (Tri-Party Agreement) with the Washington Department of Ecology (Ecology) and the US Environmental Protection Agency (EPA), in which a milestone was set to complete remediation activities and a draft closeout report by October 1994. Remediation activities will make the North Slope area available for future non-DOE uses. Thirty-nine sites have undergone limited characterization to determine if significant environmental hazards exist. This plan documents the results of that characterization and evaluates the potential remediation alternatives.

11805 (DOE/RL–93-56-3) **Quarterly report of RCRA groundwater monitoring data for period July 1, 1993–September 30, 1993.** Jungers, D.K. USDOE Richland Operations Office, WA (United States). Jan 1994. 507p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007424. Source: OSTI; NTIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," as amended (40 Code of Federal Regulations [CFR] 265). Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173–303. This quarterly report contains data received between August 21 and November 19, 1993, which are the cutoff dates for this reporting period. This report may contain not only data from samples collected during the July through September quarter but also data from earlier sampling events that were not previously reported.

11806 (INIS-GB–591) **Annual report on radioactive discharges and monitoring of the environment 1992. V. 1: Report on discharges and environmental monitoring.** British Nuclear Fuels plc, Risley (United Kingdom). Health and Safety Directorate. 1993. 97p. Order Number DE94619321. Source: OSTI; NTIS (US Sales Only); INIS.

This Annual Report supplements the Company's Health and Safety Annual Report by providing more detailed information on radioactive discharges, monitoring of the environment and critical group doses. BNFL has published Annual Reports on Radioactive Discharges and Monitoring of the Environment, covering the period from 1977 to the present. For 1990 this report has been subdivided into two complementary parts. Volume I includes annual data for each of the Company sites on radioactive discharges into the environment and the associated environmental monitoring programmes. Volume II reproduces the Certificates of Authorisation under which the Company operates and the statutory environmental monitoring programmes which relate to them. (author).

11807 (INIS-GB–592) **Annual report on radioactive discharges and monitoring of the environment 1992. V. 2: Certificates of authorisation and environmental monitoring programmes.** British Nuclear Fuels plc, Risley (United Kingdom). Health and Safety Directorate. 1993. 104p. Order Number DE94619322. Source: OSTI; NTIS (US Sales Only); INIS.

This Annual Report supplements British Nuclear Fuel plc's Health and Safety Annual Report by providing more detailed information on radioactive discharges, monitoring of the environmental and critical group doses. BNFL has published Annual Reports on Radioactive Discharges and Monitoring of the Environment, covering the period from 1977 to the present. For 1991 this report has been sub-divided into two complementary parts. Volume II reproduces the Certificates of Authorisation under which the Company operates and the statutory environmental monitoring programmes which relate to them. (author).

11808 (ORNL/ER–172) **Results of the radiological characterization survey of the Building 7819 Decontamination Facility at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Rodriguez, R.E.; Brown, K.S.; Rice, D.E.; Gosslee, R.C.; Patania, V.P. Oak Ridge National Lab., TN (United States). Dec 1993. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008061. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological characterization survey of the interior of the Building 7819 Decontamination Facility at Oak Ridge National Laboratory (ORNL) was conducted during July 1993. The interior of Building 7819 is grossly contaminated, and the contamination is highly transferable. Levels of alpha and beta contamination inside the building exceed ORNL guidelines for zoning as a Contamination Area. Gamma whole-body exposure rates generally ranged from 0.1 to 20 mR/h. Total beta-gamma surface contamination ranged from 1,000 to 520,000 dpm/100 cm^2, and transferable beta-gamma contamination ranged from 200 to 174,000 dpm/100 cm^2. A pump and a metal table near the pit exhibited beta dose rates of 3 rad/h and 300 mrad/h, respectively, and gamma exposure rates of 250 mR/h and 25 mR/h at contact, respectively. Total alpha contamination levels ranged from 100 to 110,000 dpm/100 cm^2, and transferable contamination ranged from 21 to 440 dpm/100 cm^2. The ledge at the north end of the pit above the sink demonstrated alpha contamination of approximately 100,000 dpm/100 cm^2. Radionuclide analysis of 11 smear samples showed the primary beta emitters to be ^{90}Sr and ^{137}Cs with trace amounts of ^{60}Co. The Building 7819 Decontamination Facility was zoned as a Contamination Area and Radiation Area at the time of this survey, and the zoning is justified by the results of the survey. The building will also be zoned as an Airborne Radioactivity Area, based on the results of air sampling. Recommendations for corrective actions are included.

11809 (ORNL/M–3023) **Environmental surveillance data report for the second quarter of 1993.** Gheesling, S.E.; Gideon, J.C.; Gregory, S.M.; Hamilton, L.V.; Loffman, R.S.; Salmons, M.C.; Stevens, M.M. Oak Ridge National Lab., TN (United States). Feb 1994. 194p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007085. Source: OSTI; NTIS; GPO Dep.

The Environmental Surveillance and Protection Section within the Office of Environmental Compliance and Documentation at the

Oak Ridge National Laboratory (ORNL) is responsible for the development and implementation of an environmental program to (1) ensure compliance with all federal, state, and Department of Energy (DOE) reporting requirements to quantitatively demonstrate prevention, control, and abatement of environmental pollution; (2) monitor the adequacy of containment and effluent controls; and (3) assess impacts of releases from ORNL facilities on the environment. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is the collection and analysis of samples or measurements of liquid and gaseous effluents. Environmental surveillance is the collection and analysis of samples, or direct measurements of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs. Monthly or quarterly summaries are presented in this report for each medium sampled. All data are rounded to two significant digits. The summary tables generally give the number of samples collected during the period and the maximum, minimum, average, and standard error of the mean (SE) values of parameters for which determinations were made. The SE is based upon multiple samples collected throughout the period.

11810 (PNL–9223) **Summary of radiological monitoring of Columbia River water along the Hanford Reach, 1980 through 1989.** Dirkes, R.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94008060. Source: OSTI; NTIS; INIS; GPO Dep.

The Surface Environmental Surveillance Project (SESP) is conducted by the Pacific Northwest Laboratory (PNL) for the US Department of Energy (DOE) at the Hanford Site in southeastern Washington State. The Columbia River monitoring program, conducted as part of the SESP, provides a historical record of contaminant concentrations in the river attributable to natural causes, worldwide fallout, and operations conducted at the Hanford Site. In addition to ongoing monitoring, special studies are conducted periodically to enhance the understanding of the transport and fate of contaminants in the river. The Columbia River monitoring program includes sampling of river water, river sediment, river-bank springs entering the river, and various types of aquatic biota found in or along the river. These samples are analyzed for radiological constituents and a wide range of chemical parameters. This report describes the water sampling component of the overall Columbia River monitoring program conducted during the years 1980 through 1989 and summarizes the radiological results generated through the program during this time period. The only radionuclides found in the river that were consistently influenced by Hanford were tritium and iodine-129. Strontium-90 and uranium, also attributable to Hanford operations, were present in localized areas within the river near ground-water discharge points; however, these contaminants are quickly dispersed within the river to concentrations similar to background.

11811 (SAND–93-2528) **A new analysis of the Vixen A Trials.** Luna, R.E. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (TTC–1285). Order Number DE94007249. Source: OSTI; NTIS; INIS; GPO Dep.

The source term for assessing events that involve the combustion of metallic plutonium (Pu) presents a continuing need in carrying out safety evaluations in support of DOE programs involving nuclear weapons. For production, storage, transport and decommissioning operations, an accident sequence that frequently must be evaluated involves metallic Pu being exposed in a fire environment. There are significant data on which to base an estimate for the source term which has been surveyed recently by Mishima et al (Mishima, 1993), but much of the surveyed work relates to well controlled laboratory experiments with relatively small amounts of Pu. One of the most relevant sources of information was the work by Stewart (Stewart, 1959) of the UK Atomic Weapon Research Establishment at Aldermaston. That work, referred to as the Vixen A Trials provides direct experimental data on the aerosolization and environmental releases from relatively large metallic Pu shapes immersed in a "petrol" fire. A new analysis of the air sampler data from the two Vixen A Trials experiments involving chunks of plutonium exposed to hydrocarbon fuel fires indicated a respirable release fraction (referenced to total plutonium involved) of 0.0001 to 0.0003 (1 E-4 to 3 E-4) depending on the parameters used in the atmospheric transport and dispersion model used. A value of 3 E-4 is recommended as an upper limit for use in safety assessment studies involving similar accident scenarios.

11812 (SAND–94-0276C) **An integrated approach to the characterization and decontamination of uranium contaminated soils.** Tidwell, V. (Sandia National Labs., Albuquerque, NM (United States)); Francis, C.; Armstrong, A.; Dyer, R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–27: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006601. Source: OSTI; NTIS; INIS; GPO Dep.

An Integrated Demonstration (ID) Program, hosted by the Fernald Environmental Restoration Management Company, has been established for investigating technologies applicable to the characterization and remediation of soils contaminated with uranium. Chemical and physical characterization of Fernald soils and the uranium wastes contained therein is being accomplished by means of standard analytical techniques as well as a suite of non-standard microscopy and spectroscopy techniques. Likewise, a suite of physical and chemical extraction technologies are being designed and tested for accomplishing soil decontamination. However, the main theme of this paper is not the technologies being tested but the approach taken to integrate characterization, decontamination, and risk assessment efforts. It is the authors intent to outline the critical components of an integrated approach for characterizing and remediating uranium contaminated soils as well as provide a real-world example based on the lessons learned in the ID program.

11813 (WSRC-MS–93-523) **Risk analysis and solving the nuclear waste siting problem.** Inhaber, H. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940501–1: 9. Pacific basin nuclear conference, Sydney (Australia), 1-5 May 1994). Order Number DE94003853. Source: OSTI; NTIS; INIS; GPO Dep.

In spite of millions of dollars and countless human resources being expended on finding nuclear wastes sites, the search has proved extremely difficult for the nuclear industry. This may be due to the approach followed, rather than inadequacies in research or funding. A new approach to the problem, the reverse Dutch auction, is suggested. It retains some of the useful elements of the present system, but it also adds new ones.

11814 (WSRC-RP–94-96) **Justification for change in AXAIR dispersion coefficients.** Simpkins, A.A. Westinghouse Savannah River Co., Aiken, SC (United States). Feb 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007968. Source: OSTI; NTIS; INIS; GPO Dep.

AXAIR is the primary dose assessment code used at the Savannah River Site (SRS) to predict doses following hypothetical releases of relatively short durations. The atmospheric dispersion coefficients currently used in AXAIR are analytical expressions developed to fit the curves in the Turner Workbook as referred to in USNRC Regulatory Guide 1.145. This report explores the ramifications and benefits of changing the dispersion coefficients to a combination of Pasquill's lateral dispersion coefficients and Briggs' vertical dispersion coefficients. The differences in the dispersion coefficients have a minor effect on the relative air concentrations for stability classes A–D, but a significant difference is seen for classes E, F, and G.

11815 (WSRC-TR–94-017) **Outfall K-018 TRC investigation: Final report.** Skiff, D.P. Westinghouse Savannah River Co., Aiken, SC (United States). 14 Jan 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007188. Source: OSTI; NTIS; INIS; GPO Dep.

During 1993, 7 different samples taken at Reactor Outfall K-018 for Total Residual Chlorine exceeded the permitted requirement for the outfall of < 0.1 mg/L. Following the second exceedance, a Mitigation Action Plan was issued to investigate and identify the cause

of the exceedances. The following potential causes were identified: (1) unauthorized/unknown operational discharge; (2) upstream industrial discharge to the Savannah River prior to SRS usage; (3) sanitary waste treatment plant discharge; (4) sampling methodology; (5) naturally occurring river water interference. Of these possibilities, it was determined that naturally occurring river water interference was the most likely cause and an in-depth sampling program, outlined in a Program Action Plan, was initiated to complete the investigation. The investigation determined that oxidized manganese present in the river water prior to usage within K-Area causes a false high reading for Total Residual Chlorine. It is this presence of the manganese interference, not operational discharge, that caused the exceedances at Outfall K-018.

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Refer also to citation(s) 11530, 11620, 11632, 11633, 11658, 11660, 11661, 11668, 11672, 11675, 11677, 11687, 11691, 11693, 11694, 11700, 11708, 11715, 11738, 11740, 11749, 11750, 11751, 11771, 11772, 11773, 11774, 11794, 11795, 11803, 11804, 11811, 11812, 11814, 11882, 12311, 12639, 12713, 12716, 12720, 13066, 13067, 13076, 13097, 13100, 13237, 14277

11816 (ANL/CMT/CP–80853) **Characterization of thorium and uranium contaminated soil from a nuclear fuel facility.** Brown, N.R. (Argonne National Lab., IL (United States)); Buck, E.C.; Dietz, N.L.; Bates, J.K.; Carlson, B. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–18: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006816. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the utility of soil characterization using electron microscopy to support decontamination efforts of contaminated soil. Soil contaminated with thorium and uranium from the grounds of a nuclear fuel manufacturing facility was subjected to remediation efforts. A light acid leach was able to remove only 30% of the thorium suggesting that the thorium was present in two or more forms. Analytical electron microscopy determined that all of the thorium was present as ThO_2, but in a bimodal size distribution and occasionally closely associated with other minerals. Electron microscopy was useful in understanding the remediation data and demonstrates the need for characterization of contaminated soils.

11817 (ANL/CMT/CP–80854) **Supporting soil remediation at Fernald by electron beam methods.** Buck, E.C.; Brown, N.R.; Dietz, N.L.; Cunnane, J.C. Argonne National Lab., IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–34: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006831. Source: OSTI; NTIS; INIS; GPO Dep.

Electron beam techniques have been used to characterize uranium-contaminated soils at the Fernald Site, Ohio. The major uranium phases have been identified by analytical electron microscopy (AEM) as uranyl phosphate (autunite), uranium oxide (uraninite), and uranium phosphite [$U(PO_3)_4$]. Luminescence and X-ray absorption spectroscopy incorrectly identified uranium oxide hydrate (schoepite) as the major phase in Fernald soils. The solubilities of schoepite and autunite are very different, so a solubility-dependent remediation method selected for schoepite will not be effective for removing autunite. AEM is the only technique capable of precisely identifying unknown submicron phases. The uranium phosphite has been found predominantly at the incinerator site at Fernald. This phase has not been removed successfully by any of the chemical remediation technologies. We suggest that an alternative physical extraction procedure be applied to remove this phase.

11818 (ANL/DIS/CP–80823) **Stakeholder Involvement in DOE's Cost Improvement Initiative for Environmental Restoration and Waste Management activities.** Jackson, J.; Gillette, J.; Goldberg, M.; Hooper, C. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–35: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006811. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE) Office of Environmental Restoration and Waste Management (EM) designed and executed the Benchmarking for Cost Improvement (Benchmarking) initiative to understand and control costs. The results of the nationwide survey component of the Benchmarking initiative are presented. The goal of the nationwide survey was to identify the issues that most frequently contribute to the cost growth and/or cost overruns on DOE programs and to develop a framework in which those issues may effectively be addressed. Stakeholders were asked to evaluate 26 cost issues organized in four categories (COST ESTIMATING, PROGRAMMATIC, RESOURCES, and REGULATORY) in terms of how frequently each contributes to cost growth and/or overruns. Respondents also provided written suggestions when asked to identify the single most important action that DOE could implement to reduce cost growth and/or overruns. Finally, they were asked to provide an example of a recently implemented cost-saving action that could be replicated within DOE. EM can better control programmatic costs and more effectively spend taxpayers' dollars by implementing the recommendations of the Benchmarking stakeholders and by building on its relationships with them.

11819 (ANL/DIS/CP–80940) **Department of Energy decontamination and decommissioning project experience.** Price, W.J. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–22: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006827. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated risk-based approach has been developed to address the human health risks of radiological and chemical releases from potential facility accidents in support of the U.S. Department of Energy (DOE) Environmental Restoration and Waste Management (EM) Programmatic Environmental Impact Statement (PEIS). Accordingly, the facility accident analysis has been developed to allow risk-based comparisons of EM PEIS strategies for consolidating the storage and treatment of wastes at different sites throughout the country. The analysis has also been developed in accordance with the latest DOE guidance by considering the spectrum of accident scenarios that could occur in implementing the various actions evaluated in the EM PEIS. The individual waste storage and treatment operations and inventories at each site are specified by the functional requirements defined for each waste management alternative to be evaluated. For each alternative, the accident analysis determines the risk-dominant accident sequences and derives the source terms from the associated releases. This information is then used to perform health effects and risk calculations that are used to evaluate the various alternatives.

11820 (ANL/EA/CP–80956) **Overview of the facility accident analysis for the U.S. Department of Energy Environmental Restoration and Waste Management Programmatic Environmental Impact Statement.** Mueller, C. (Argonne National Lab., IL (United States)); Habegger, L.; Huizenga, D. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–21: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006825. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated risk-based approach has been developed to address the human health risks of radiological and chemical releases from potential facility accidents in support of the U.S. Department of Energy (DOE) Environmental Restoration and Waste Management (EM) Programmatic Environmental Impact Statement (PEIS). Accordingly, the facility accident analysis has been developed to allow risk-based comparisons of EM PEIS strategies for consolidating the storage and treatment of wastes at different sites throughout the country. The analysis has also been developed in accordance with the latest DOE guidance by considering the spectrum of accident scenarios that could occur in implementing the various actions evaluated in the EM PEIS. The individual waste storage and treatment operations and inventories at each site are

specified by the functional requirements defined for each waste management alternative to be evaluated. For each alternative, the accident analysis determines the risk-dominant accident sequences and derives the source terms from the associated releases. This information is then used to perform health effects and risk calculations that are used to evaluate the various alternatives.

11821 (ANL/EA/CP–80969) **Methodology and computational framework used for the US Department of Energy Environmental Restoration and Waste Management Programmatic Environmental Impact Statement accident analysis.** Mueller, C. (Argonne National Lab., IL (United States)); Roglans-Ribas, J.; Folga, S.; Huttenga, A.; Jackson, R.; TenBrook, W.; Russell, J. Argonne National Lab., IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–36: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006815. Source: OSTI; NTIS; INIS; GPO Dep.

A methodology, computational framework, and integrated PC-based database have been developed to assess the risks of facility accidents in support of the US Department of Energy (DOE) Environmental Restoration and Waste Management Programmatic Environmental Impact Statement. The methodology includes the following interrelated elements: (1) screening of storage and treatment processes and related waste inventories to determine risk-dominant facilities across the DOE complex, (2) development and frequency estimation of the risk-dominant sequences of accidents, and (3) determination of the evolution of and final compositions of radiological or chemically hazardous source terms predicted to be released as a function of the storage inventory or treatment process throughput. The computational framework automates these elements to provide source term input for the second part of the analysis which includes (1) development or integration of existing site-specific demographics and meteorological data and calculation of attendant unit-risk factors and (2) assessment of the radiological or toxicological consequences of accident releases to the general public and to the occupational work force.

11822 (ANL/EA/CP–80972) **Hazardous waste storage facility accident scenarios for the U.S. Department of Energy Environmental Restoration and Waste Management Programmatic Environmental Impact Statement.** Policastro, A. (Argonne National Lab., IL (United States)); Roglans-Ribas, J.; Marmer, D.; Lazaro, M.; Mueller, C.; Freeman, W. Argonne National Lab., IL (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–51: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007674. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the methods for developing accident categories and accident frequencies for internally initiated accidents at hazardous waste storage facilities (HWSFs) at US Department of Energy (DOE) sites. This categorization is a necessary first step in evaluating the risk of accidents to workers and the general population at each of the sites. This risk evaluation is part of the process of comparing alternative management strategies in DOE's Environmental Restoration and Waste Management (EM) Programmatic Environmental Impact Statement (PEIS). Such strategies involve regionalization, decentralization, and centralization of waste treatment, storage, and disposal activities. Potential accidents at the HWSFs at the DOE sites are divided into categories of spill alone, spill plus fire, and other event combinations including spill plus fire plus explosion, fire only, spill and explosion, and fire and explosion. One or more accidents are chosen to represent the types of accidents for FY 1992 for 12 DOE sites were studied to determine the most representative set of possible accidents at all DOE sites. Each accident scenario is given a probability of occurrence that is adjusted, depending on the throughput and waste composition that passes through the HWSF at the particular site. The justification for the probabilities chosen is presented.

11823 (ANL/EA/CP–80977) **Collecting mixed waste information for Department of Energy Environmental Restoration activities.** Tolbert-Smith, M. (Dept. of Energy, Germantown, MD (United States)); MacDonell, M.; Peterson, J. Argonne National Lab., IL (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–50: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007655. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Office of Environmental Restoration is currently developing an integrated data structure to link information on wastes and contaminated media from environmental restoration activities with other program information, including waste management plans. Mixed wastes are a key element of this data system because of the reporting requirements of the recent Federal Facility Compliance Act. The first step taken to satisfy various environmental restoration program needs was to develop a data call that would capture information on contamination and cleanup projections for all environmental restoration sites.

11824 (ARH–1394) **Nuclear and chemical safety analysis: Purex Plant 1970 thorium campaign.** Boldt, A.L.; Oberg, G.C. Atlantic Richfield Hanford Co., Richland, WA (United States). 22 May 1970. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007816. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this document is to discuss the flowsheet and the related processing equipment with respect to nuclear and chemical safety. The analyses presented are based on equipment utilization and revised piping as outlined in the design criteria. Processing of thorium and uranium-233 in the Purex Plant can be accomplished within currently accepted levels of risk with respect to chemical and nuclear safety if minor instrumentation changes are made. Uranium-233 processing is limited to a rate of about 670 grams per hour by equipment capacities and criticality safety considerations. The major criticality prevention problems result from the potential accumulation of uranium-233 in a solvent phase in E-H4 (ICU concentrator), TK-J1 (IUC receiver), and TK-J21 (2AF pump tank). The same potential problems exist in TK-J5 (3AF pump tank) and TK-N1 (3BU receiver), but the probabilities of reaching a critical condition are not as great. In order to prevent the excessive accumulation of uranium-233 in any of these vessels by an extraction mechanism, it is necessary to maintain the uranium-233 and salting agent concentrations below the point at which a critical concentration of uranium-233 could be reached in a solvent phase.

11825 (BNL–49736) **Polyethylene encapsulation of single-shell tank low-level wastes: FY-93 interim progress report.** Kalb, P.D. Brookhaven National Lab., Upton, NY (United States). Jun 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94008091. Source: OSTI; NTIS; INIS; GPO Dep.

For the past 50 years, the US Department of Energy and its predecessor agencies have stored large volumes of defense-related radioactive and mixed wastes in underground tanks. Initially, these tanks were constructed of single steel walls surrounded by reinforced concrete and are known as single-shell tanks (SSTs). Over time, the highly corrosive contents caused many of the tanks to begin to leak. As part of its effort to remediate leaking and potentially leaky tanks, DOE has established the Underground Storage Tank Integrated Demonstration (UST-ID). The overall objectives of the UST-ID include facilitating the development and demonstration of enhanced technologies that will lead to improved treatment and stabilization of underground storage tank wastes. The host site for the UST-ID is Hanford, but the program addresses potential use of these emerging technologies in remediation of tanks at five DOE facilities: Hanford, Fernald, Idaho, Oak Ridge, and Savannah River. In order to meet its objectives, the UST-ID supports technology development in six focus areas including: (1) waste characterization, (2) high- and low-level waste treatment and disposal, (3) retrieval, transfer, and storage, (4) waste separation, (5) in situ treatment and disposal, and (6) site closure. This report describes work supported by the UST-ID, conducted at Brookhaven National Laboratory, to develop and demonstrate a polyethylene waste encapsulation process for low-level radioactive and hazardous mixed wastes stored in underground tanks. The objective of Phase I is to investigate the potential impacts of residual heat and high radiation doses on key waste forms properties including mechanical integrity, strength, and leachability.

11826 (DOE/AL/62350–53F-Rev.1) **Site-specific analysis of radiological and physical parameters for cobbly soils at the Gunnison, Colorado, processing site: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1994. 326p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94006202. Source: OSTI; NTIS; INIS; GPO Dep.

The remedial action at the Gunnison, Colorado, processing site is being performed under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. Under UMTRCA, the US Environmental Protection Agency (EPA) is charged with the responsibility of developing appropriate and applicable standards for the cleanup of radiologically contaminated land and buildings at 24 designated sites, including the Gunnison, Colorado, inactive processing site. Section 108 of Public Law 95-604 states that the US Department of Energy (DOE) shall "select and perform remedial actions at the designated processing sites and disposal sites in accordance with the general standards" prescribed by the EPA. Regulations governing the required remedial action at inactive uranium processing sites were promulgated by the EPA in 1983 and are contained in 40 CFR Part 192 (1993), Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings. This document describes the radiological and physical parameters for the remedial action of the soil.

11827 (DOE/AL/62350–78) **UMTRA project water sampling and analysis plan – Shiprock, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007201. Source: OSTI; NTIS; INIS; GPO Dep.

Water sampling and analysis plan (WSAP) is required for each U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site to provide a basis for ground water and surface water sampling at disposal and former processing sites. This WSAP identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequency for the monitoring stations at the Navaho Reservation in Shiprock, New Mexico, UMTRA Project site. The purposes of the water sampling at Shiprock for fiscal year (FY) 1994 are to (1) collect water quality data at new monitoring locations in order to build a defensible statistical data base, (2) monitor plume movement on the terrace and floodplain, and (3) monitor the impact of alluvial ground water discharge into the San Juan River. The third activity is important because the community of Shiprock withdraws water from the San Juan River directly across from the contaminated alluvial floodplain below the abandoned uranium mill tailings processing site.

11828 (DOE/AL/62350–86) **Radiological, health, and safety, and occurrence reporting system audit report, Rifle, Colorado: Audit date, September 14–16, 1993.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94003176. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an audit dated September 14–16, 1993. The performance of the contractors and subcontractors responsible for remedial action work at the former uranium ore processing site at Rifle, Colorado, and the uranium tailings disposal cell at Estes Gulch (Colorado) was reviewed during an audit conducted September 14 through 16, 1993. MK-Ferguson Company (MK-F) is the Remedial Action Contractor (RAC) responsible for engineering and construction management of the Rifle operations. The audit focused on radiological issues, occupational safety and health (OS&H) issues, and the Occurrence Reporting and Processing System (ORPS). The close-out meeting was held on September 16, 1993, which was attended by representatives of MK-F, the US Department of Energy (DOE), and the Technical Assistance Contractor (TAC).

11829 (DOE/AL/62350–92) **Ground water protection management program plan.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007198. Source: OSTI; NTIS; INIS; GPO Dep.

U.S. Department of Energy (DOE) Order 5400.1 requires the establishment of a ground water protection management program to ensure compliance with DOE requirements and applicable federal, state, and local laws and regulations. The Uranium Mill Tailings Remedial Action (UMTRA) Project Office was prepared this Ground Water Protection Management Program Plan (ground water protection plan) whose scope and detail reflect the program's significance and address the seven activities required in DOE Order 5400.1, Chapter III, for special program planning. This ground water protection plan highlights the methods designed to preserve, protect, and monitor ground water resources at UMTRA Project processing and disposal sites. The plan includes an overview of the remedial action status at the 24 designated processing sites and identifies technical guidance documents and site-specific documents for the UMTRA Project ground water protection management program. In addition, the plan addresses the general information required to develop a water resources protection strategy at the permanent disposal sites. Finally, the plan describes ongoing activities that are in various stages of development at UMTRA Project sites.

11830 (DOE/AL/62350–108) **UMTRA Project Office Federal Employee Occupational Safety and Health Program Plan: Final draft.** Young, B.H. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94008245. Source: OSTI; NTIS; GPO Dep.

This document establishes the Federal Employee Occupational Safety and Health (FEOSH) Program for the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project Office. This program will ensure compliance with the applicable requirements of DOE Order 3790.1 B and DOE Albuquerque Operations Office (AL) Order 3790.1A. FEOSH Program responsibilities delegated by the DOE-AL to the UMTRA Project Office by AL Order 3790.1A also are assigned. The UMTRA Project Office has developed the UMTRA Project Environmental, Safety, and Health (ES&H) Plan (DOE, 1992), which establishes the basic programmatic ES&H requirements for all participants on the UMTRA Project. The ES&H plan is designed primarily to cover remedial action activities at UMTRA sites, and defines the ES&H responsibilities of both the UMTRA Project Office and its contractors. The UMTRA FEOSH Program described herein is a subset of the overall UMTRA ES&H program and covers only the federal employees working on the UMTRA Project.

11831 (DOE/AL/62350–109) **Technical approach for the management of UMTRA ground water investigation-derived wastes.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94008246. Source: OSTI; NTIS; INIS; GPO Dep.

During characterization, remediation, or monitoring activities of the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project, ground water samples are collected to assess the extent and amount of waterborne contamination that might have come from the mill tailings. This sampling sometimes occurs in contaminated areas where ground water quality has been degraded. Ground water sampling activities may result in field-generated wastes that must be disposed of in a manner protective of human health and the environment. During ground water sampling, appropriate measures must be taken to dispose of pre-sampling purge water and well development water that is pumped to flush out any newly constructed wells. Additionally, pumping tests may produce thousands of gallons of potentially contaminated ground water that must be properly managed. In addition to the liquid wastes, there is the potential for bringing contaminated soils to the ground surface during the drilling and installation of water wells in areas where the subsurface soils may be contaminated. These soils must be properly managed as well. This paper addresses the general technical approach that the UMTRA Project will follow in managing field-generated wastes from well drilling, development, sampling, and testing. It will provide guidance for the preparation of Technical Assistance Contractor (TAC) Standard Operating Procedures (SOP) for the management and disposal of field-generated wastes from ground water monitoring and remediation activities.

11832 (DOE/CH–9202) **Minimally invasive three-dimensional site characterization system: Final report.** Steedman, D. (Applied Research Associates, Inc., Albuquerque, NM (United States)); Seusy, F.E.; Gibbons, J.; Bratton, J.L. Argonne National Lab., IL (United States); Applied Research Associates, Inc., Albuquerque, NM (United States). Sep 1993. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007974. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an improved for hazardous site characterization. The major components of the systems are: (1) an enhanced cone penetrometer test, (2) surface geophysical surveys and (3) a field database and visualization code. The objective of the effort was to develop a method of combining geophysical data with cone penetrometer data in the field to produce a synergistic effect. Various aspects of the method were tested at three sites. The results from each site are discussed and the data compared. This method allows the data to be interpreted more fully with greater certainty, is faster, cheaper and leads to a more accurate site characterization. Utilizing the cone penetrometer test rather than the standard drilling, sampling and laboratory testing reduces the workers exposure to hazardous materials and minimizes the hazardous material disposal problems. The technologies employed in this effort are, for the most part, state-of-the-art procedures. The approach of using data from various measurement systems to develop a synergistic effect was a unique contribution to environmental site characterization. The use of the cone penetrometer for providing "ground truth" data and as a platform for subsurface sensors in environmental site characterization represents a significant advancement in environmental site characterization.

11833 (DOE/EA–0464-Rev.3) **Environmental assessment of remedial action at the Naturita uranium processing site near Naturita, Colorado: Revision 3.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007202. Source: OSTI; NTIS; INIS; GPO Dep.

The proposed remedial action for the Naturita processing site is relocation of the contaminated materials and debris to the Dry Flats disposal site, 6 road miles (mi) [10 kilometers (km)] to the southeast. At the disposal site, the contaminated materials would be stabilized and covered with layers of earth and rock. The proposed disposal site is on land administered by the Bureau of Land Management (BLM) and used primarily for livestock grazing. The final disposal site would cover approximately 57 ac (23 ha), which would be permanently transferred from the BLM to the DOE and restricted from future uses. The remedial action activities would be conducted by the DOE's Uranium Mill Tailings Remedial Action (UMTRA) Project. The proposed remedial action would result in the loss of approximately 162 ac (66 ha) of soils at the processing and disposal sites; however, 133 ac (55 ha) of these soils at and adjacent to the processing site are contaminated and cannot be used for other purposes. If supplemental standards are approved by the NRC and state of Colorado, approximately 112 ac (45 ha) of contaminated soils adjacent to the processing site would not be cleaned up. This area is steeply sloped. The cleanup of this contamination would have adverse environmental consequences and would be potentially hazardous to remedial action workers. Another 220 ac (89 ha) of soils would be temporarily disturbed during the remedial action. The final disposal site would result in approximately 57 ac (23 ha) being removed from livestock grazing and wildlife use.

11834 (DOE/NV/10833–T2) **Tomographic data developed using the ABEM RAMAC borehole radar system at the Mixed Waste Landfill Integrated Demonstration.** MacLeod, G.A. (Raytheon Services Nevada, Las Vegas, NV (United States)); Barker, D.L.; Molnar, S. Raytheon Services Nevada, Las Vegas, NV (United States); USDOE Office of Arms Control and Nonproliferation, Washington, DC (United States). 18 Feb 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-91NV10833. Order Number DE94007119. Source: OSTI; NTIS; GPO Dep.

The ABEM RAMAC borehole radar system was run as part of the Mixed Waste Landfill Integrated Demonstration for Sandia National Laboratories at Kirtland AFB. Tomograms were created between three test boreholes-UCAP No. 1, UCAP No. 2, and UCAP No. 3. These tomograms clearly delineate areas of amplitude attenuation and residual time of arrival or slowness differences. Plots for slowness were made using both the maximum and minimum of the first arrival pulse. The data demonstrates that the ABEM RAMAC 60-MHz pulse sampling radar system can be used to collect usable data in a highly conductive environment.

11835 (DOE/OR/21981–T2) **Tennessee Health Studies Agreement annual report, January 1, 1993–September 30, 1993.** Oak Ridge Health Agreement Steering Panel, TN (United States). Nov 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007047. Source: OSTI; NTIS; GPO Dep.

This report presents an overview of the second grant year of the Tennessee Health Studies Agreement. During the second year of the Health Studies Agreement, the dose reconstruction feasibility study will be completed. The State and the ORHASP will plan a strategy for identifying opportunities to perform analytical epidemiological studies in the Oak Ridge area to determine if adverse health outcomes have occurred as a result of ORR operations.

11836 (DOE/OR/21981–T3-Vol.1) **Oak Ridge Health Studies phase 1 report, Volume 1: Oak Ridge Phase 1 overview.** Yarbrough, M.I.; Van Cleave, M.L.; Turri, P.; Daniel, J. Tennessee Dept. of Health, Nashville, TN (United States). Div. of Environmental Epidemiology. Sep 1993. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007048. Source: OSTI; NTIS; INIS; GPO Dep.

In July 1991, the State of Tennessee initiated the Health Studies Agreement with the United States Department of Energy to carry out independent studies of possible adverse health effects in people living in the vicinity of the Oak Ridge Reservation. The health studies focus on those effects that could have resulted or could result from exposures to chemicals and radioactivity released at the Reservation since 1942. The major focus of the first phase was to complete a Dose Reconstruction Feasibility Study. This study was designed to find out if enough data exist about chemical and radionuclide releases from the Oak Ridge Reservation to conduct a second phase. The second phase will lead to estimates of the actual amounts or the "doses" of various contaminants received by people as a result of off-site releases. Once the doses of various contaminants have been estimated, scientists and physicians will be better able to evaluate whether adverse health effects could have resulted from the releases.

11837 (DOE/OR/21981–T3-Vol.2-Pt.B) **Oak Ridge Health Studies Phase 1 report, Volume 2, Part B, Dose Reconstruction Feasibility Study: Tasks 3 and 4, Identification of important environmental pathways for materials released from the Oak Ridge Reservation.** Brorby, G.P.; Bruce, G.M.; Widner, T.E. ChemRisk, Alameda, CA (United States). Sep 1993. 238p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007050. Source: OSTI; NTIS; INIS; GPO Dep.

While each of the three different screening comparisons made in this report (i.e., within-medium evaluation, between-media evaluation and relative importance grouping) individually provides information potentially of value in focusing future studies, each one is subject to a variety of limitations, the most important being associated with the absence or variable quality of environmental data for a number of the contaminants and media. These screening exercises are intended to provide an initial framework for approaching the study of an extremely complex site. Other approaches could very well yield somewhat different priorities, and the identification or reinterpretation of data in subsequent detailed studies are likely to invalidate some of the results of these screening exercises. However, these evaluations provide a logical approach to defining initial off- site health impact study priorities for the ORR. Therefore, while care must be taken in attempting to make any broad generalizations or greatly simplifying assumptions with regard to the potential health hazards posed by the complex releases from the Reservation, Table 6-1 represents an attempt to summarize a set

of recommendations that are derived from the screening exercises presented in this report. Table 6-1 identifies the facilities, processes and contaminants believed to have the highest potential for resulting in off-site health impacts. Table 6-2 identifies contaminants for which no ranking could be performed as part of this feasibility study, because of the absence of any appropriate data for any environmental medium.

11838 (DOE/OR/21981–T3-Vol.2-Pt.C) **Oak Ridge Health Studies Phase 1 report, Volume 2: Part C, Dose Reconstruction Feasibility Study: Tasks 5: A summary of information concerning historical locations and activities of populations potentially affected by releases from the Oak Ridge Reservation.** DaMassa, C.L.; Widner, T.E. ChemRisk, Alameda, CA (United States). Sep 1993. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91OR21981. Order Number DE94007051. Source: OSTI; NTIS; INIS; GPO Dep.

A significant number of information sources have been identified that are relevant to historical locations and activities of populations potentially affected by releases from the Oak Ridge Reservation. The information that has been reviewed as part of this Task 5 investigation has shown that numerous residences and farms have historically been present near the ORR boundary and that a variety of land uses and recreational activities have been practiced. Based on this information alone, it would appear that many routes of off-site exposure could have been plausible. Most of the available published information addresses demographic and land use data on a regional or county-wide basis over fairly broad time periods. The information sources that are most readily available do not support direct evaluation of potential exposure pathways at specific geographic locations near the Oak Ridge facilities at specific points in time. A number of information sources have been identified that can provide demography and land use information more specific to locations and time periods that are identified to be of interest. Examples of data sources in this category include individual USGS topographic maps, aerial photographs, lowest-level census tract data, and interviews with long-time local residents. However, specific release events and periods of interest should be identified prior to attempts to collect more specific demographic or land use information for actual dose reconstruction.

11839 (DOE/RL–92-76) **Remedial Investigation/Feasibility Study Work Plan for the 200-UP-1 Groundwater Operable Unit, Hanford Site, Richland, Washington: Revision.** USDOE Richland Operations Office, WA (United States). Jan 1994. 277p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007154. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan identifies the objectives, tasks, and schedule for conducting a Remedial Investigation/Feasibility Study for the 200-UP-1 Groundwater Operable Unit in the southern portion of the 200 West Groundwater Aggregate Area of the Hanford Site. The 200-UP-1 Groundwater Operable Unit addresses contamination identified in the aquifer soils and groundwater within its boundary, as determined in the 200 West Groundwater Aggregate Area Management Study Report (AAMSR) (DOE/RL 1992b). The objectives of this work plan are to develop a program to investigate groundwater contaminants in the southern portion of the 200 West Groundwater Aggregate Area that were designated for Limited Field Investigations (LFIs) and to implement Interim Remedial Measures (IRMs) recommended in the 200 West Groundwater AAMSR. The purpose of an LFI is to evaluate high priority groundwater contaminants where existing data are insufficient to determine whether an IRM is warranted and collect sufficient data to justify and implement an IRM, if needed. A Qualitative Risk Assessment (QRA) will be performed as part of the LFI. The purpose of an IRM is to develop and implement activities, such as contaminant source removal and groundwater treatment, that will ameliorate some of the more severe potential risks of groundwater contaminants prior to the RI and baseline Risk Assessment (RA) to be conducted under the Final Remedy Selection (FRS) at a later date. This work plan addresses needs of a Treatability Study to support the design and implementation of an interim remedial action for the Uranium-$^{99}T_c$-Nitrate multi-contaminant IRM plume identified beneath U Plant.

11840 (DOE/RL–93-21-Vol.2) **Phase 1, Remedial investigation report for the 300-FF-5 operable unit: Volume 2.** USDOE Richland Operations Office, WA (United States). Jan 1994. 1145p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008646. Source: OSTI; NTIS; INIS; GPO Dep.

Volume two contains the following appendices: 300-FF-5 spring, sediment, Columbia River – water and spring groundwater well analytical data; 300-FF-5 borehole soil analytical data; 300-FF-5 groundwater analytical data for 1st, 2nd, 3rd, and 4th sampling rounds; numerical groundwater flow and transport modeling; pertinent correspondence; data quality summary; monthly potentiometric surface contour maps of the unconfined aquifer in the 300-FF-5 operable unit; applicable or relevant and appropriate requirements; calculations of estimated future groundwater concentrations resulting from 300-FF-1 soil contamination; risk assessment example calculations; plume maps for 300-FF-5 operable unit contaminants of potential concern; analytical model input; and toxicity profiles for contaminants of potential concern at the 300-FF-5 operable unit.

11841 (DOE/RL–93-38) **Hanford Integrated Planning Process: 1993 Hanford Site-specific science and technology plan.** Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 470p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–8951). Order Number DE94007992. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the FY 1993 report on Hanford Site-specific science and technology (S&T) needs for cleanup of the Site as developed via the Hanford Integrated Planning Process (HIPP). It identifies cleanup problems that lack demonstrated technology solutions and technologies that require additional development. Recommendations are provided regarding allocation of funding to address Hanford's highest-priority technology improvement needs, technology development needs, and scientific research needs, all compiled from a Sitewide perspective. In the past, the S&T agenda for Hanford Site cleanup was sometimes driven by scientists and technologists, with minimal input from the "problem owners" (i.e., Westinghouse Hanford Company [WHC] staff who are responsible for cleanup activities). At other times, the problem-owners made decisions to proceed with cleanup without adequate scientific and technological inputs. Under both of these scenarios, there was no significant stakeholder involvement in the decision-making process. One of the key objectives of HIPP is to develop an understanding of the integrated S&T requirements to support the cleanup mission, (a) as defined by the needs of the problem owners, the values of the stakeholders, and the technology development expertise that exists at Hanford and elsewhere. This requires a periodic, systematic assessment of these needs and values to appropriately define a comprehensive technology development program and a complementary scientific research program. Basic to our success is a methodology that is defensible from a technical perspective and acceptable to the stakeholders.

11842 (DOE/RL–93-38-Exec.Summ.) **1993 Hanford Site-Specific Science and Technology Plan: Hanford Integrated planning process, Executive summary.** Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PNL–8960). Order Number DE94004713. Source: OSTI; NTIS; GPO Dep.

The Hanford Site-Specific Science and Technology Plan (HSSSTP) documents the integrated science and technology (S&T) needs for cleanup of the Hanford Site as developed via Hanford integrated planning. This summary of the HSSSTP includes background information; an explanation of the purpose of the plan; a description of the integrated S&T needs assessment methodology; and principal results, conclusions, and recommendations.

11843 (EGG-WTD–10784-Vol.1) **Idaho National Engineering Laboratory waste area groups 1–7 and 10 Technology Logic Diagram: Volume 1.** O'Brien, M.C.; Meservey, R.H.; Little, M.; Ferguson, J.S.; Gilmore, M.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008589. Source: OSTI; NTIS; INIS; GPO Dep.

The Technology Logic Diagram was developed to provide technical alternatives for environmental restoration projects at the Idaho

National Engineering Laboratory. The diagram (three volumes) documents suggested solutions to the characterization, retrieval, and treatment phases of cleanup activities at contaminated sites within 8 of the laboratory's 10 waste area groups. Contaminated sites at the laboratory's Naval Reactor Facility and Argonne National Laboratory-West are not included in this diagram.

11844 (EGG-WTD–10784-Vol.2) **Idaho National Engineering Laboratory Waste Area Groups 1-7 and 10 Technology Logic Diagram: Volume 2.** O'Brien, M.C.; Meservey, R.H.; Little, M.; Ferguson, J.S.; Gilmore, M.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 574p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008590. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) Technology Logic Diagram (TLD) was developed to provide a decision support tool that relates Environmental Restoration (ER) and Waste Management (WM) problems at the INEL to potential technologies that can remediate these problems. The TLD identifies the research, development, demonstration, testing, and evaluation needed to develop these technologies to a state that allows technology transfer and application to an environmental restoration need. It is essential that follow-on engineering and system studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in this TLD and finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk to meet the site windows of opportunity. The TLD consists of three separate volumes: Volume I includes the purpose and scope of the TLD, a brief history of the INEL Waste Area Groups, and environmental problems they represent. A description of the TLD, definitions of terms, a description of the technology evaluation process, and a summary of each subelement, is presented. Volume II (this volume) describes the overall layout and development of the TLD in logic diagram format. This section addresses the environmental restoration of contaminated INEL sites. Specific INEL problem areas/contaminants are identified along with technology solutions, the status of the technologies, precise science and technology needs, and implementation requirements. Volume III provides the Technology Evaluation Data Sheets (TEDS) for Environmental Restoration and Waste Management (EM) activities that are referenced by a TEDS codenumber in Volume II. Each of these sheets represents a single logic trace across the TLD. These sheets contain more detail than provided for technologies in Volume II.

11845 (EGG-WTD–10784-Vol.3) **Idaho National Engineering Laboratory Waste Area Groups 1-7 and 10 Technology Logic Diagram: Volume 3.** O'Brien, M.C.; Meservey, R.H.; Little, M.; Ferguson, J.S.; Gilmore, M.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 347p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008591. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) Technology Logic Diagram (TLD) was developed to provide a decision support tool that relates Environmental Restoration (ER) and Waste Management (WM) problems at the INEL to potential technologies that can remediate these problems. The TLD identifies the research, development, demonstration, testing, and evaluation needed to develop these technologies to a state that allows technology transfer and application to an environmental restoration need. It is essential that follow-on engineering and system studies be conducted to build on the output of this project. These studies will begin by selecting the most promising technologies identified in this TLD and finding an optimum mix of technologies that will provide a socially acceptable balance between cost and risk to meet the site windows of opportunity. The TLD consists of three separate volumes: Volume I includes the purpose and scope of the TLD, a brief history of the INEL Waste Area Groups, and environmental problems they represent. A description of the TLD, definitions of terms, a description of the technology evaluation process, and a summary of each subelement, is presented. Volume II describes the overall layout and development of the TLD in logic diagram format. This section addresses the environmental restoration of contaminated INEL sites. Volume III (this volume) provides the Technology Evaluation Data Sheets (TEDS) for Environmental Restoration and Waste Management (EM) activities that are reference by a TEDS code number in Volume II. Each of these sheets represents a single logic trace across the TLD. These sheets contain more detail than provided for technologies in Volume II. Data sheets are arranged alphanumerically by the TEDS code number in the upper right corner of each sheet.

11846 (FEMP–2291) **Identifying environmental safety and health requirements for an Environmental Restoration Management Contractor.** Beckman, W.H. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project); Cossel, S.C.; Alhadeff, N.; Porco, D.J.; Lindamood, S.B.; Beers, J.A. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. (CONF-931095–77: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94006524. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Standards/Requirements Identification Program, developed partially in response to the Defense Nuclear Facilities Safety Board Recommendation 90-2, was to identify applicable requirements that established the Environmental Restoration Management Contractor's (ERMC) responsibilities and authorities under the Environmental Restoration Management Contract, determine the adequacy of these requirements, ascertain a baseline level of compliance with them, and implement a maintenance program that would keep the program current as requirements or compliance levels change. The resultant Standards/Requirements Identification Documents (S/RIDs) consolidate the applicable requirements. These documents govern the development of procedures and manuals to ensure compliance with the requirements. Twenty-four such documents, corresponding with each functional area identified at the site, are to be issued. These requirements are included in the contractor's management plan.

11847 (HW–69561) **Hazard analysis for cesium shipments.** Watson, E.C.; Junkins, R.L.; Fuquay, J.J. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 11 May 1961. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007887. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The rail shipment of large quantities of radiocesium involves a potential accidental release of this material in a readily available form to the biosphere. The magnitude of the associated potential damage to man and his environment is evaluated in this report. The evaluation of the consequences of an accidental release of Cs-137 from the Shielded Transfer Tank, Model II (STT) assumes loss of Cs-137 to the atmosphere or to surface-water. Release to the atmosphere could result from a collision followed by fire or explosion. In the event of a fire, a small fraction of the Cs-137 vould be volatilized. An explosion would disperse the Cs-137 still adsorbed to Decalso as particulates. In either case, the material is assumed to be dispersed by atmospheric mechanisms which can be described by modified Sutton equations. The accident involving a fire or explosion assumes that 1 percent or 10 percent, respectively, of 90,000 curies of Cs-137 is dispersed in a metropolitan area. Contamination of the surrounding suburban area is also involved. Damage estimates amount to about 60 million dollars and 400 million dollars, corresponding to a 1 percent and a 10 percent release respectively. Another possible type of accident involves the release of the Decalso (an inorganic ion exchange carrier for the cesium) into a river. However, the release of Cs-137 by elution into the river results in minor damage compared to the atmospheric release cases.

11848 (HW–79944) **Radiological aspects of dissolving irradiated Li-Al.** Owen, F.E. Hanford Works, Richland, WA (United States). 11 Dec 1963. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007896. Source: OSTI; NTIS (US Sales Only); GPO Dep.

If a metal shipment from the reactors to a chemical processing plant contained irradiated Li-Al pieces, there would be a release of tritium during processing. Two situations were analyzed – one where a single piece is inadvertently mixed in a bucket of irradiated

uranium metal pieces, and the extreme case where three buckets of Li-Al instead of uranium are sent in a regular well car shipment. One piece contains about 600 curies of H^3 and three buckets of 585, pieces each would contain a total of about 10^6 curies. Release of tritium from Li-Al pieces in the CPD irradiated uranium metal dissolvers would occur during the caustic coating removal step. About 100 curies are available in three buckets of metal, which could potentially cause (1) exposure of plant personnel up to 1 rem during sample handling or from inhalation of stack gases, (2) exposure of off-site personnel up to 50 mrem, (3) a five per cent increase in ground water tritium, and (4) some restriction on possible future handling of the contents of an underground coating waste storage tank. It is not believed any occupational or general public exposure limits would be exceeded. It would probably exceed an operational atmosphere release limit recommended by RPO, HL, of an average of 2000 curies per week per plant, which is 10^5 curies in a year. Investigation and evaluation of the situation would no doubt cause a great deal of concern. The involvement of one Li-Al piece would create no problem of radiological concern.

11849 (LA–12700) **SNM holdup assessment of Los Alamos exhaust ducts: Final report.** Marshall, R.S. Los Alamos National Lab., NM (United States). Feb 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007116. Source: OSTI; NTIS; INIS; GPO Dep.

Fissile material holdup in glovebox and fume hood exhaust ducting has been quantified for all Los Alamos duct systems. Gamma-based, nondestructive measurements were used to quantify holdup. The measurements were performed during three measurement campaigns. The first campaign, Phase I, provided foot-by-foot, semiquantitative measurement data on all ducting. These data were used to identify ducting that required more accurate (quantitative) measurement. Of the 280 duct systems receiving Phase I measurements, 262 indicated less than 50 g of fissile holdup and 19 indicated fissile holdup of 50 or more grams. Seven duct systems were measured in a second campaign, called Series 1, Phase II. Holdup estimates on these ducts ranged from 421 g of ^{235}U in a duct servicing a shut-down uranium-machining facility to 39 g of ^{239}Pu in a duct servicing an active plutonium-processing facility. Measurements performed in the second campaign proved excessively laborious, so a third campaign was initiated that used more efficient instrumentation at some sacrifice in measurement quality. Holdup estimates for the 12 duct systems measured during this third campaign ranged from 70 g of ^{235}U in a duct servicing analytical laboratories to 1 g of ^{235}U and 1 g of ^{239}Pu in a duct carrying exhaust air to a remote filter building. These quantitative holdup estimates support the conclusion made at the completion of the Phase I measurements that only ducts servicing shut-down uranium operations contain about 400 g of fissile holdup. No ventilation ducts at Los Alamos contain sufficient fissile material holdup to present a criticality safety concern.

11850 (LA-UR–94-557) **Determining uranium speciation in contaminated soils by molecular spectroscopic methods: Examples from the Uranium in Soils Integrated Demonstration.** Allen, P.G.; Berg, J.M.; Chisholm-Brause, C.J.; Conradson, S.D.; Donohoe, R.J.; Morris, D.E.; Musgrave, J.A.; Tait, C.D. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–57: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007578. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's former uranium production facility located at Fernald, OH (18 mi NW of Cincinnati) is the host site for an Integrated Demonstration for remediation of uranium-contaminated soils. A wide variety of source terms for uranium contamination have been identified reflecting the diversity of operations at the facility. Most of the uranium contamination is contained in the top ~1/2 m of soil, but uranium has been found in perched waters indicating substantial migration. In support of the development of remediation technologies and risk assessment, we are conducting uranium speciation studies on untreated and treated soils using molecular spectroscopies. Untreated soils from five discrete sites have been analyzed. We have found that ~80–90% of the uranium exists as hexavalent UO_2^{2+} species even though many source terms consisted of tetravalent uranium species such as UO_2. Much of the uranium exists as microcrystalline precipitates (secondary minerals). There is also clear evidence for variations in uranium species from the microscopic to the macroscopic scale. However, similarities in speciation at sites having different source terms suggest that soil and groundwater chemistry may be as important as source term in defining the uranium speciation in these soils. Characterization of treated soils has focused on materials from two sites that have undergone leaching using conventional extractants (e.g., carbonate, citrate) or novel chelators such as Tiron. Redox reagents have also been used to facilitate the leaching process. Three different classes of treated soils have been identified based on the speciation of uranium remaining in the soils. In general, the effective treatments decrease the total uranium while increasing the ratio of U(IV) to U(VI) species.

11851 (LA-UR–94-598) **Tank waste remediation system milestone report magnetic separation of tank waste: Surrogate system separations report.** Avens, L.R.; Worl, L.A.; Schake, A.R.; Padilla, D.D.; de Aguero, K.J.; Prenger, F.C.; Stewart, W.F.; Hill, D.D. Los Alamos National Lab., NM (United States). 14 Jan 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007567. Source: OSTI; NTIS; GPO Dep.

High-level radioactive waste (HLW) has been stored in large underground storage tanks (UST) at the US Department of Energy's Hanford Site since 1944. More than 253,000 m^3 of waste have been accumulated in 177 tanks. The waste consists of many different chemicals and are in the form of liquids, slurries, salt cakes and sludges. A magnetic separation effort at Los Alamos National Laboratory is funded through the Tank Waste Remediation System (TWRS) to explore the use of high-gradient magnetic separation (HGMS) for tank waste segregation. The concept is to concentrate into a low volume waste stream, all or most of the magnetic components, which include actinide compounds, most of the fission products and precious metals. As a first step in this process investigations were made on surrogate systems. This milestone report discusses the HGMS results on these systems.

11852 (ORNL/ER–164) **Quality assurance plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Knoxville, TN (United States). Jan 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008063. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Plan (QAP) is concerned with design and construction (Sect. 2) and characterization and monitoring (Sect. 3). The basis for Sect. 2 is the Quality Assurance Plan for the Design and Construction of Waste Area Grouping 6 Closure at Oak Ridge National Laboratory, Oak Ridge, Tennessee, and the basis for Sect. 3 is the Environmental Restoration Quality Program Plan. Combining the two areas into one plan gives a single, overall document that explains the requirements and from which the individual QAPs and quality assurance project plans can be written. The Waste Area Grouping (WAG) 6 QAP establishes the procedures and requirements to be implemented for control of quality-related activities for the WAG 6 project. Quality Assurance (QA) activities are subject to requirements detailed in the Martin Marietta Energy Systems, Inc. (Energy Systems), QA Program and the Environmental Restoration (ER) QA Program, as well as to other quality requirements. These activities may be performed by Energy Systems organizations, subcontractors to Energy Systems, and architect-engineer (A-E) under prime contract to the US Department of Energy (DOE), or a construction manager under prime contract to DOE. This plan specifies the overall Energy Systems quality requirements for the project. The WAG 6 QAP will be supplemented by subproject QAPs that will identify additional requirements pertaining to each subproject.

11853 (ORNL/ER–208) **Annual summary report of the Decontamination and Decommissioning Surveillance and Maintenance Program at Oak Ridge National Laboratory for period ending September 30, 1993: Environmental Restoration Program.** Oak Ridge National Lab., TN (United States). Nov 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC05-84OR21400. Order Number DE94004745. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory (CRNL) Decontamination and Decommissioning (D&D) Program has continued to provide surveillance and maintenance (S&M) support for 34 surplus facilities. The objectives are to (1) ensure adequate containment of residual radioactive materials remaining in the facilities, (2) provide safety and security controls to minimize the potential hazards to on-site personnel and the general public, and (3) manage the facilities in the most cost-effective manner while awaiting decommissioning. This support has included work in three principal areas: (1) S&M planning, (2) routine S&M, and (3) special projects designed to correct serious facility deficiencies beyond the scope of routine maintenance.

11854 (PNL-SA–22008) **Implementation of in situ vitrification for contaminated soils.** Luey, J. (Pacific Northwest Lab., Richland, WA (United States)); Roberts, J.S.; Timmerman, C.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308137–10: 1993 summer national American Institute of Chemical Engineers (AIChE) conference, Seattle, WA (United States), 15-18 Aug 1993). Order Number DE94004361. Source: OSTI; NTIS; INIS; GPO Dep.

Geosafe Corporation will be implementing the in situ vitrification (ISV) technology commercially at a Superfund site in Michigan. In preparation for the Michigan site, Geosafe Corporation performed two operational acceptance tests (OATs) at the Geosafe Test Site in Richland, Washington. The objectives were to test the performance of the equipment and to train operating personnel. In addition, Geosafe cooperated with the Pacific Northwest Laboratory and the US Department of Energy, Office of Technology Development in a full-scale field data collection effort to obtain data characterizing the dynamic conditions in the soil created by the advancing ISV melt. This full-scale information provides empirical data to support the current understanding of the ISV technology for contaminated soil applications and provides verification of the accuracy of computational modeling tools being used to evaluate the applicability of the ISV technology to different soil sites.

11855 (PNL-SA–22431) **Using the global positioning system in support of environmental characterization at the Hanford Site in Washington State.** Peterson, L.B. (Pacific Northwest Lab., Richland, WA (United States)); Tzemos, S.; Dietz, L.A. Pacific Northwest Lab., Richland, WA (United States); Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830 ; AC06-87RL10930. (CONF-931095–73: Department of Energy environmental remediation conference, Augusta, GA (United States), 24-28 Oct 1993). Order Number DE94004292. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's 1,450 km^2 Hanford Site in southeastern Washington State accumulated hazardous wastes for more than 50 years. To support the Site's mission of environmental restoration and cleanup, the Global Positioning System (GPS) is being used to verify waste site locations and provide location information for field samples. Collected GPS data are stored for use in the Hanford Geographic Information System (HGIS). The NAVSTAR GPS is a space-based electronic navigation and positioning system designed and operated by the US Department of Defense (DOD). The system consists of three major components: (1) the space segment, comprising 24 earth-orbiting satellites; (2) the control segment, made up of 5 control and monitoring stations placed around the globe; and (3) the user segment, which includes users worldwide. When declared fully operational by the DOD, the NAVSTAR GPS will allow users to identify their geographical position anywhere on earth at any time. There are no user fees for the service and anyone with a GPS receiver may use the system worldwide. The one major hindrance to the system is the DOD policy concerning a security option called Selective Availability (SA). Selective Availability affects the usability of the system by intentional manipulation of the GPS signals to degrade the accuracy of the user's positions. The period and magnitude of degradation is solely a DOD privilege. The DOD policy on SA is to vary the error in position calculated from the Standard Positioning Service code to approximately 100 m root-mean squared (RMS). With SA on and other possible errors included, users may know their location to within a few hundred meters. While this accuracy is good for many applications, it is too inaccurate for others.

11856 (PNL-SA–22796) **Control criteria for residual contamination in materials considered for recycle and reuse.** Kennedy, W.E. Jr.; Hill, R.L.; Aaberg, R.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9311144–1: International ATomic Energy Association (IAEA) specialists meeting on experience in the application of exemption principles, Vienna (Austria), 1-5 Nov 1993). Order Number DE94004770. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) is collecting data and conducting technical analyses to support the US Department of Energy (DOE), Office of Environmental Guidance, Air, Water, and Radiation Division (DOE/EH-232) in determining the feasibility of developing radiological control criteria for recycling or reuse of metals or equipment containing residual radioactive contamination from DOE operations. The criteria, framed as acceptable concentrations for release of materials for recycling or reuse, will be risk-based and will be developed through analysis of radiation exposure scenarios and pathways. The analysis will include evaluation of relevant radionuclides, potential mechanisms of exposure, and non-health-related impacts of residual radioactivity on electronics and film. The analyses will consider 42 key radionuclides that are generated during DOE operations and may be contained in recycled or reused metals or equipment.

11857 (PNL-SA–22797) **Estimation of costs for applications of remediation technologies for the Department of Energy's Programmatic Environmental Impact Statement.** Villegas, A.J.; Hansen, R.I.; Humphreys, K.K.; Paananen, J.M.; Gildea, L.F. Pacific Northwest Lab., Richland, WA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–69: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008046. Source: OSTI; NTIS; INIS; GPO Dep.

The Programmatic Environmental impact Statement (PEIS) being developed by the US Department of Energy (DOE) for environmental restoration (ER) and waste management (WM) activities expected to be carried out across the DOE's nationwide complex of facilities is assessing the impacts of removing, transporting, treating, storing, and disposing of waste from these ER and WM activities. Factors being considered include health and safety impacts to the public and to workers, impacts on the environment, costs and socio-economic impacts, and near-term and residual risk during those ER and WM operations. The purpose of this paper is to discuss the methodology developed specifically for the PEIS to estimate costs associated with the deployment and application of individual remediation technologies. These individual costs are used in developing order-of-magnitude cost estimates for the total remediation activities. Costs are developed on a per-unit-of-material-to-be-treated basis (i.e., $\$/m^3$) to accommodate remediation projects of varying sizes. The primary focus of this cost-estimating effort was the development of capital and operating unit cost factors based on the amount of primary media to be removed, handled, and treated. The unit costs for individual treatment technologies were developed using information from a variety of sources, mainly from periodicals, EPA documentation, handbooks, vendor contacts, and cost models. The unit cost factors for individual technologies were adjusted to 1991 dollars.

11858 (PNL-SA–23727) **Managing risk at Hanford.** Hesser, W.A. (Pacific Northwest Lab., Richland, WA (United States)); Stillwell, W.G.; Rutherford, W.A. Pacific Northwest Lab., Richland, WA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–58: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008059. Source: OSTI; NTIS; INIS; GPO Dep.

Clearly, there is sufficient motivation from Washington for the Hanford community to pay particular attention to the risks associated with the substantial volumes of radiological, hazardous, and

mixed waste at Hanford. But there is also another reason for emphasizing risk: Hanford leaders have come to realize that their decisions must consider risk and risk reduction if those decisions are to be technically sound, financially affordable, and publicly acceptable. The 560-square miles of desert land is worth only a few thousand dollars an acre (if that) – hardly enough to justify the almost two billion dollars that will be spent at Hanford this year. The benefit of cleaning up the Hanford Site is not the land but the reduction of potential risk to the public and the environment for future generations. If risk reduction is our ultimate goal, decisions about priority of effort and resource allocation must consider those risks, now and in the future. The purpose of this paper is to describe how Hanford is addressing the issues of risk assessment, risk management, and risk-based decision making and to share some of our experiences in these areas.

11859 (WHC-SA–1529) **Combining expedited cleanup with innovative technology demonstrations.** Hagood, M.C. (Westinghouse Hanford Co., Richland, WA (United States)); Rohay, V.J.; Valcich, P.J.; Brouns, T.M.; Cameron, R.J. Westinghouse Hanford Co., Richland, WA (United States). Apr 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930906–20: '93 international conference on nuclear waste management and environmental remediation; Innovative technologies for cleaning the environment: air, water, and soil, Prague (Czech Republic); Erice (Italy), 5-11 Sep 1993; 22-29 apr 1992; C Order Number DE94005485. Source: OSTI; NTIS; INIS; GPO Dep.

A Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) expedited response action (ERA) has been initiated at the Hanford Site, Washington, for the removal of carbon tetrachloride from contaminated soils to mitigate further contamination of the groundwater. Soil vapor extraction with above-ground collection and treatment was chosen as the preferred remedial technology for the first phase of the ERA. At the same time, innovative technology demonstrations are being conducted in coordination with the ERA to determine the viability of emerging technologies that can be used to characterize, remediate, and monitor carbon tetrachloride and cocontaminants. The overall goal is to improve the performance and decrease the costs of carbon tetrachloride remediation while maintaining a safe working environment.

11860 (WHC-SA–2254) **Thermal-spectrum recriticality energetics.** Schwinkendorf, K.N. Westinghouse Hanford Co., Richland, WA (United States). Dec 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940407–3: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94005418. Source: OSTI; NTIS; INIS; GPO Dep.

Large computer codes have been created in the past to predict the energy release in hypothetical core disruptive accidents (CDA), postulated to occur in liquid metal reactors (LMR). These codes, such as SIMMER, are highly specific to LMR designs. More recent attention has focused on thermal-spectrum criticality accidents, such as for fuel storage basins and waste tanks containing fissile material. This paper resents results from recent one-dimensional kinetics simulations, performed for a recriticality accident in a thermal spectrum. Reactivity insertion rates generally are smaller than in LMR CDAs, and the energetics generally are more benign. Parametric variation of input was performed, including reactivity insertion and initial temperature.

11861 (WHC-SA–2304) **Preliminary results of a seismic borehole test using downhole shaped charges at the DOE Hanford Site.** Narbutovskih, S.M. (Westinghouse Hanford Co., Richland, WA (United States)); Michelsen, F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940353–4: Symposium on the application of geophysics to environmental and engineering problems, Boston, MA (United States), 27-31 Mar 1994). Order Number DE94008077. Source: OSTI; NTIS; GPO Dep.

Geophysical site characterization studies can be important steps in the process of designing and monitoring remediation at hazardous waste storage facilities. Use of seismic techniques for subsurface characterization at the DOE Hanford Site has been limited. One reason is the lack of borehole velocity control, and low-velocity sediments are highly attenuative. Consequently, standard techniques to provide velocity control are not adequate. Both Vertical Seismic Profiling and reversed VSP surveys are currently being investigated to provide velocity control and for subsurface imaging capabilities. Recently a jet perforating gun was used to perforate a doubled-cased borehole in the 200 West Area. Acoustic emissions were recorded from numerous depths to obtain velocity control for a previous surface survey conducted in the same area. Both P- and S-wave data were recorded simultaneously from multiple horizons using the DAS-1 seismograph and 3-component geophones. The data were analyzed for a variety of uses besides velocity control. Signal attenuation was studied as a function of source depth and offset distance to evaluate formation absorption while vertical resolution was determined from the frequency spectrum. Preliminary results indicate that adequate P-wave velocity control can be obtained even though the near-surface sediments are very attenuative. However, we conclude that the perforating gun produces little SH energy. Preliminary velocities indicate that reflection coefficients should be great enough to use surface techniques. Results from the frequency study suggest that a swept source for both surface and borehole surveys may be necessary to obtain required resolutions. Finally, signal attenuation as a function of formation facies suggest that seismic techniques may be useful in mapping perched water zones and for long term vadose zone monitoring.

11862 (WHC-SD-EN-AP–122) **Hanford well remediation and decommissioning plan.** Ledgerwood, R.K. Westinghouse Hanford Co., Richland, WA (United States). 12 Feb 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007147. Source: OSTI; NTIS; INIS; GPO Dep.

Protection of Hanford Site groundwater resources and assessment of the effects of their use or contamination upon public safety are required by federal and state regulations and U.S. Department of Energy (DOE) policy, (DOE, 1989). Compliance with constraints applicable to the use of existing wells requires assessment as to the suitability for use and needs for rehabilitation, remediation or decommissioning of existing groundwater wells and other boreholes potentially affecting aquifers beneath the Hanford Site. Approximately 3,500 groundwater wells and vadose zone boreholes had been drilled on the Hanford Site prior to 1989, over 2,900 still exist. Most of these boreholes were drilled prior to 1987 and do not conform to presently accepted construction standards intended to protect groundwater resources. Approximately 260 wells have been installed since 1987. These wells were constructed to current standards for well construction which mandate seals between the permanent casing and the formation to prevent potential migration of contaminated liquid. Several programs presently construct and/or utilize existing and newly drilled wells to provide characterization and groundwater monitoring data. The programs are summarized.

11863 (WHC-SD-EN-AP–154) **Field characterization plan for the 216-U-8 vitrified clay pipeline.** Rowley, C.A. Westinghouse Hanford Co., Richland, WA (United States). 21 Jan 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007146. Source: OSTI; NTIS; INIS; GPO Dep.

The 216-U-8 Crib was constructed in 1952 and received waste from 1952 to 1960 as described in Appendix A. This description of work details the field activities associated with the characterization of the vitrified clay pipe (VCP) delivery line to the 216-U-8 Crib and subsurface soil sampling along the pipe route in the 200 West Area of Hanford U Plant. It will serves as a field guide for those performing the work. Soil sampling locations will be determined by a combination of radiological surface surveys and internal camera surveys of the VCP line. Depending on the condition of the pipeline and field conditions, the objectives are as follows: examine the internal condition of the VCP with a survey camera to the extent allowed by field conditions; determine precise location and depth of the VCP; document VCP integrity; document gamma radiation profile through the VCP; and correlate any relationships between surface contamination zones at grade above the VCP to identify breaches in the pipe integrity.

11864 (WHC-SD-EN-RA–014) **Riverland ERA maintenance pad site diesel contamination risk assessment.** Valcich, P.J. Westinghouse Hanford Co., Richland, WA (United States). 2 Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94005461. Source: OSTI; NTIS; GPO Dep.

The maintenance pad site consists of a concrete pad and underlying soils, approximately 15 by 46 m in area, and a drainage ditch with dimensions of 2.4 by 91 m. The ditch is located approximately 60 m from the concrete pad and is oriented parallel to the pads long axis. The facility was built in 1943, at which time the concrete pad was the floor of a maintenance shed for railroad activities. In 1955, use of the facility as a maintenance shed was discontinued. Between 1955 and 1957, the facility was used as a radioactivity decontamination area for railroad cars; acetone-soaked rags were used to remove surface contamination from the cars. The concrete pad was washed down with a mixture of water and diesel fuel, which was then flushed via clay pipe to the drainage ditch. In 1963, the maintenance shed was torn down and the concrete pad covered with approximately one-half meter of fill. The concrete pad was re-exposed in 1993. The site was sampled for Toxicity Characteristic Leachate Procedure (TCLP) metals, volatile, and semi-volatile compounds, as well as for extractable fuel hydrocarbons. A total of 17 samples were collected from surface concrete, soil beneath surface concrete, and ditch soil. One concrete sample and one ditch soil sample were split. The ditch soil sample was also duplicated. The relative percent difference (RPD) in extractable hydrocarbons of the two split samples, one from concrete and one from ditch soil are, respectively, 52% and 186%. The RPD for the duplicate sample, taken from the same ditch soil sample from which one of the splits was taken, is 39%.

11865 (WHC-SD-EN-TI–212) **100-DR-1 radiological surveys.** Naiknimbalkar, N.M. Westinghouse Hanford Co., Richland, WA (United States). 28 Jan 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94006994. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes and documents the results of the radiological surveys conducted over the surface of the 100-DR-1 Operable Unit, Hanford Site, Richland, Washington. In addition, this report explains the survey methodology using the Ultrasonic Ranging and Data System (USRADS). The 100-DR-1 radiological survey field task consisted of two activities: characterization of the operable unit-specific background conditions and the radiological survey of the operable unit surface area. The survey methodology was based on utilization of USRADS for automated recording of the gross gamma radiation levels at or near 6 in. and at 3 ft from the surface soil. The purpose of the survey is to identify the location of unidentified subsurface radioactive material areas and any surface contamination associated with these areas. The radiological surveys were conducted using both a digital count rate meter with a NaI detector reporting in counts per minute (CPM) and a dose rate meter reporting micro-Roentgen per hour (uR) connected to a CHEMRAD Tennessee Corp. Series 2000 USRADS. The count rate meter was set for gross counting, i.e., Window "out". The window setting allows detection of low, intermediate, and high energy photons. The USRADS equipment is used to record the detector readings verses the location of the readings, generate a map of the survey area, and save the data on computer storage media.

11866 (WHC-SD-WM-DP–018) **Assessment of annual exposure for grout operations.** Potter, R.E. Westinghouse Hanford Co., Richland, WA (United States). 3 Feb 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007985. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis is presented of the direct radiation exposures and dose rates to personnel from assumed quantities of radioactive grout, and Double Shell Tank (DST) waste feed. This analysis was based on filling four disposal vaults per year. Whole body doses were analyzed for occupational workers assigned to the Grout Treatment Facility (GTF). The study makes assumptions that must be met by the facility. Otherwise, the GTF will meet all DOE and WHC direct radiation exposure criteria. This analysis will be published in the Grout Final Safety Analysis Report (FSAR).

11867 (WSRC-MS–93-448) **Criticality accident detector coverage analysis using the Monte Carlo Method.** Zino, J.F.; Okafor, K.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940424–21: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94007195. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the need for a more accurate computational methodology, the Los Alamos developed Monte Carlo code MCNP is used to show the implementation of a more advanced and accurate methodology in criticality accident detector analysis. This paper will detail the application of MCNP for the analysis of the areas of coverage of a criticality accident alarm detector located inside a concrete storage vault at the Savannah River Site. The paper will discuss; (1) the generation of fixed-source representations of various criticality fission sources (for spherical geometries); (2) the normalization of these sources to the "minimum criticality of concern" as defined by ANS 8.3; (3) the optimization process used to determine which source produces the lowest total detector response for a given set of conditions; and (4) the use of this minimum source for the analysis of the areas of coverage of the criticality accident alarm detector.

11868 (WSRC-TR–93-346-Rev.1) **SRS ES&H standards compliance program management plan: Revision 1.** Hearn, W.H. Westinghouse Savannah River Co., Aiken, SC (United States). 8 Sep 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007282. Source: OSTI; NTIS; INIS; GPO Dep.

On March 8, 1990, the Defense Nuclear Facilities Safety Board (DNFSB) issued Recommendation 90-2 to the Secretary of Energy. This recommendation, based upon the DNFSB's initial review and evaluation of the content and implementation of standards relating to the design, construction, operations, and decommissioning of defense nuclear facilities of the Department of Energy (DOE), called for three actions: (1) identification of specific standards that apply to design, construction, operation and decommissioning of DOE facilities; (2) assessment of the adequacy of those standards for protecting public health and safety; and (3) determination of the extent to which they have and are being implemented. This document defines the elements of the SRS program required to support the HQ program in response to DNFSB Recommendation 90-2. The objective is to ensure a consistent approach for all sitewide ES and H Standards Compliance Program efforts that satisfied the intent of Recommendation 90-2 and the HQ 90-2 Implementation Plan in a cost-effective manner. The methodology and instructions for implementation of the SRS program are contained in the Standards Compliance Program Implementation Plan. The Management Plan shall be used in conjunction with the Implementation Plan.

11869 (Y/DZ–1043) **Aqueous mercury treatment technology review for NPDES Outfall 49 Y-12 Plant.** Lanning, J.M. Oak Ridge Y-12 Plant, TN (United States). Apr 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94003682. Source: OSTI; NTIS; GPO Dep.

During 1950 to 1955, Building 9201-2 at the Oak Ridge Y-12 Plant was used to house development facilities for processes that employed elemental mercury to separate lithium isotopes as part of the thermonuclear weapons production operations. As a result of several spills, this building area and several other areas associated with the separation process were contaminated with mercury and became a source of continuing contamination of the Y-12 Plant discharge water to East Fork Poplar Creek (EFPC). Mercury concentrations in the outfalls south of Building 9201-2 have ranged up to 80 ppb, with the highest concentrations being experienced at Outfall 49. As a result, this outfall was chosen as a test site for future mercury treatment technology evaluation and development at the Oak Ridge Y-12 Plant. A literature review and vendor survey has identified several promising materials and technologies that may be applicable to mercury removal at the Outfall 49 site. This document summarizes those findings.

0550 Safeguards, Inspection, and Accountability

Refer also to citation(s) 11634, 11654, 12460, 12470, 12781, 12965

11870 (AEA-FS–0229-H) **Safeguards implications of laser isotope separation.** Moriarty, T.F.; Taylor, K. AEA Technology, Harwell (United Kingdom). Oct 1993. 50p. Order Number DE94616602. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this report is to describe and emphasise the safeguards and relevant features of atomic vapour laser isotope separation (AVLIS) and molecular laser isotope separation (MLIS), and to consider the issues that must be addressed before a safeguards approach at a commercial AVLIS or MLIS facility can be implemented. (Author).

11871 (BNL–49978) **Detection probabilities for random inspection in variable flow situations.** Lu, Ming-Shih. Brookhaven National Lab., Upton, NY (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (IAEA-SM–33/124; CONF-940307–19: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994). Order Number DE94007175. Source: OSTI; NTIS; INIS; GPO Dep.

Improvements in the efficiency and effectiveness of inventory-change verification are necessary at certain nuclear facilities, of which one example is low-enriched uranium fuel fabrication facilities. The Safeguards Criteria suggested carrying out interim inventory-change verifications with randomized inspections. This paper describes randomized inspection schemes for inventory change verifications and evaluates the achievable detection probabilities for realistic plant receipt and shipment schedules and stratum residence times as a. function of the inspection frequency and effort and compares these with the existing inspection strategies.

11872 (DOE/FTR–94004454) **Travel to Austria to participate in DOE/IS-40's presentations: Foreign trip report, October 11, 1993–October 16, 1993.** Mangan, D.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94004454. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of the trip, which was to support the DOE/ISD agenda to expose IAEA personnel to DOE technology, went quite well. An overview of the DOE/ISD program took place on Wednesday, October 13. The following two days, October 14 and October 15, were, spent having one-on-one discussions with various members of the IAEA staff. The program overview stimulated considerable interest on the part of the IAEA- There several new ideas werc generated during "one-on-one" discussions. With Winston Alston and his section, I discussed a system that combined an attribute gamma detector with the Authenticated Item Monitoring System (AIMS), with the possibility of being remotely monitored, for use in Argentina and Brazil. We also discussed advanced digital video surveillance systems, also with the remote monitoring capability. With Tom Shea and his section, I discussed integrated safeguards systems, expanded capabilities of AIMS, infra-red (IR) video surveillance, "short interval" surveillance, and the secure sample vial work. With Klaus Gaertner I discussed basically the advanced digital surveillance system and the desired of Michael Goldfarb to obtain AIMS for evaluation. All of the above indicated they would request DOE support through tho US Mission.

11873 (ES/CSET–19) **Nuclear Criticality Safety Application Guide: Safety Analysis Report Update Program.** Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Central Safety Evaluation Team. Feb 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007917. Source: OSTI; NTIS; GPO Dep.

Martin Marietta Energy Systems, Inc. (MMES) is committed to performing and documenting safety analyses for facilities it manages for the Department of Energy (DOE). Safety analyses are performed to identify hazards and potential accidents; to analyze the adequacy of measures taken to eliminate, control, or mitigate hazards; and to evaluate potential accidents and determine associated risks. Safety Analysis Reports (SARs) are prepared to document the safety analysis to ensure facilities can be operated safely and in accordance with regulations. Many of the facilities requiring a SAR process fissionable material creating the potential for a nuclear criticality accident. MMES has long had a nuclear criticality safety program that provides the technical support to fissionable material operations to ensure the safe processing and storage of fissionable materials. The guiding philosophy of the program has always been the application of the double-contingency principle, which states: "process designs shall incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible." At Energy Systems analyses have generally been maintained to document that no single normal or abnormal operating conditions that could reasonably be expected to occur can cause a nuclear criticality accident. This application guide provides a summary description of the MMES Nuclear Criticality Safety Program and the MMES Criticality Accident Alarm System requirements for inclusion in facility SARs. The guide also suggests a way to incorporate the analyses conducted pursuant to the double-contingency principle into the SAR. The prime objective is to minimize duplicative effort between the NCSA process and the SAR process and yet adequately describe the methodology utilized to prevent a nuclear criticality accident.

11874 (INIS-XN–478) **Exchange of Notes constituting an Agreement between the Government of Australia and the Government of the United States of America to bring International Obligation Exchanges under the Coverage of the Agreement concerning Peaceful Uses of Nuclear Energy, and Agreed Minute, of 5 July 1979.** Australia. 16 Dec 1991. 4p. Order Number DE94618338. Source: OSTI; NTIS (US Sales Only); INIS.

Published in Australian Treaty Series 1991 No. 48.

This Agreement applies to transfers of materials between both countries with reference to their respective safeguards obligations. (NEA).

11875 (JAERI-M–93-217) **The compact surveillance and monitoring system 'COSMOS': The function and its operation.** Ogawa, Hironobu (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sadamatsu, Yukio. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 62p. (In Japanese). Order Number DE94748670. Source: OSTI; NTIS; INIS.

The Japan Atomic Energy Research Institute (JAERI) has developed a surveillance video camera device named 'COSMOS' (Compact Surveillance and Monitoring System) for the replacement of the Twin Minolta Film Camera system that have been used by the International Atomic Energy Agency (IAEA). Since the Minolta Company was reported to cease the production of the relevant camera, the JAERI started the development under the Japanese Support Programme for the Agency Safeguards (JASPAS). A COSMOS system consists of two units; one is a main unit and the other is a set-up/review unit. The main unit consists of three parts, i.e., four modules, a main frame and a tamper-indicating housing. The four modules are a small CCD camera module with an auto-iris lens and an 8 mm VTR module that is specifically designed for COSMOS, a video frame memory module, a system control module, and DC or AC power supply module. The most important target in the COSMOS design is to achieve a long period operation with low power consumption, which enables the system operate for three months with one battery, and produce 30,000 shots with 5 minutes time interval. The IAEA carried out its reliability tests and field tests and completed with successful results, with which the IAEA approved the COSMOS as an authorized equipment for IAEA inspection use. This report describes the function and operation of the COSMOS, which are particularly needed at the stage of its installation. (author).

11876 (KFK–5101) **Accountancy under typical operational strategies used in tritium processing.** Avenhaus, R. (Universitaet der Bundeswehr Muenchen, Neubiberg (Germany). Inst. fuer Angewandte Systemforschung und Operations Research); Spannagel, G. Kernforschungszentrum Karlsruhe GmbH (Germany). Hauptabteilung Sicherheit; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion. Feb 1993. 18p. Order Number DE94752390. Source: OSTI; NTIS (US Sales Only); INIS.

Tritium handling implies tritium bearing waste streams. Part of this tritium is recovered in appropriate processing steps. An accountancy system is investigated for use in such a process. In particular, the chances of a safe and timely detection of anomalies are evaluated in quantitative terms. (orig.)

11877 (K/NSP–165) **Unresolved-issues concerning the final disposal of nuclear material discards.** Moran, B.W. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Murphey, W.M. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). 31 Jan 1994. 9p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (IAEA-SM–333/120; CONF-940307–12: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994). Order Number DE94006678. Source: OSTI; NTIS; INIS; GPO Dep.

The 1989 International Atomic Energy Agency Consultants' Meetings for Development of Technical Criteria for Termination of Safeguards for Material Categorized as Measured discards did not produce a consensus of opinion on several significant issues. This paper presents summary information form studies performed on two of the issues: recoverability of nuclear material from high activity waste and inert dilution of wastes. Concerns regarding recoverability of nuclear material in the wastes first require resolution of political and technical issues before technical criteria can be finalized. Potential termination criteria based on ratios of fission products to nuclear material content are identified that could be used to resolve the inert dilution concerns associated with high-activity liquid waste.

11878 (SAND–93-2263) **Integrated alarm annunciation and entry control systems – Survey results.** Clever, J.J.; Arakaki, L.H.; Monaco, F.M.; Juarros, L.E.; Quintana, G.R. Sandia National Labs., Albuquerque, NM (United States). Oct 1993. 196p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008111. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the results and analyses of a detailed survey undertaken in Summer 1993 to address integrated intrusion detection alarm annunciation and entry control system issues. This survey was undertaken as a first attempt toward beginning to answer questions about integrated systems and commercial capabilities to meet or partially meet US Department of Energy (DOE) site needs.

11879 (UCRL-ID–106454-94-1) **Lawrence Livermore National Laboratory Safeguards and Security quarterly progress report to the US Department of Energy: Quarter ending December 31, 1993.** Davis, G.; Mansur, D.L.; Ruhter, W.D.; Steele, E.; Strait, R.S. Lawrence Livermore National Lab., CA (United States). Jan 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008080. Source: OSTI; NTIS; GPO Dep.

The Lawrence Livermore National Laboratory (LLNL) carries out safeguards and security activities for the Department of Energy (DOE), Office of Safeguards and Security (OSS), as well as other organizations, both within and outside the DOE. This document summarizes the activities conducted for the OSS during the first quarter of fiscal year 1994 (October through December, 1993). The nature and scope of the activities carried out for OSS at LLNL require a broad base of technical expertise. To assure projects are staffed and executed effectively, projects are conducted by the organization at LLNL best able to supply the needed technical expertise. These projects are developed and managed by senior program managers. Institutional oversight and coordination is provided through the LLNL Deputy Director's office. At present, the Laboratory is supporting OSS in five areas: (1) Safeguards Technology, (2) Safeguards and Decision Support, (3) Computer Security, (4) DOE Automated Physical Security, and (5) DOE Automated Visitor Access Control System. This report describes the activities in each of these five areas. The information provided includes an introduction which briefly describes the activity, summary of major accomplishments, task descriptions with quarterly progress, summaries of milestones and deliverables and publications published this quarter.

0560 Legislation and Regulations

Refer also to citation(s) 11609, 11673, 11674, 12302, 12305, 12308, 13275

11880 (INIS-mf–13827) **Radiation protection of the Bulgarian population in the light of the new national 'General Standards for Radiation Protection - 1992'.** Vasilev, G.; Khristova, M. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 3p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94618331. Source: OSTI; NTIS (US Sales Only); INIS.

The new normative document 'General Standards for Radiation Protection -1992' determines the binding limits for protection of a particular man and the whole population from the hazardous effect of ionizing radiations. The following basic characteristics connected with the specific Bulgarian conditions are pointed out: specifying of the three categories of irradiated persons (professionals; isolated persons and groups; population as a whole); limits of the annual effective doses for particular categories; normalizing of radionuclide intake in the body based on two criteria: effective and equivalent dose; standardization of the medical surveillance. (A.B.).

11881 (INIS-XN–477) **No. 434 - Radiation Control Regulation 1993.** Australia. 27 Aug 1993. 23p. Order Number DE94618332. Source: OSTI; NTIS (US Sales Only); INIS.

Published in Gazette No. 94.

This Regulation, made under the Radiation Control Act 1990, replaces the Radioactive Substances Regulation 1959, repealed by the 1990 Act. It deals with licensing of the use of radioactive substances and radiation apparatus, regulates their use, disposal and transport. It also provides for radiation monitoring and emergency planning. (NEA).

11882 (PNL-SA–23650) **RCRA permitting strategies for the development of innovative technologies: Lessons from Hanford.** Gajewski, S.W.; Donaghue, J.F. Pacific Northwest Lab., Richland, WA (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–62: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94008052. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site restoration is the largest waste cleanup operation in history. The Hanford plutonium production mission generated two-thirds of all the nuclear waste, by volume, in the Department of Energy (DOE) Complex. Cleanup challenges include not only large stored volumes of radioactive, hazardous, and mixed waste, but contaminated soil and groundwater and scores of major structures slated for decontamination, decommissioning, and demolition. DOE and its contractors will need to invent the technology required to do the job on a timetable driven by negotiated milestones, public concerns, and budgetary constraints. This paper will discuss the effort at Hanford to develop an integrated, streamlined strategy for compliance with the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in the conduct of research, development, and demonstration (RD&D) of innovative cleanup technologies. The aspects that will be discussed include the following: the genesis of the RD&D permitting challenge at Hanford; permitting options in the existing regulatory framework; regulatory options that offered the best fit for Hanford RD&D activities, and the problems associated with them; and conclusions and recommendations made to regulatory bodies.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

Refer also to citation(s) 12696

11883 (INIS-mf–13800) **Design and construction of a prototype for distillation of ^{131} I by the dry method.** Palacios Gonzalez, O.G.M. Instituto Tecnologico, Toluca (Mexico). 1993. 107p. (In Spanish). Order Number DE94616078. Source: OSTI; NTIS (US Sales Only); INIS.

Due to need of a procedure standard for production of ^{131} I in the Mexican Republic, is very important stablish, based in two proof for the method in hot of distillation in dry development satisfactory (radiochemistry purity of distillation 99.7 %). The development of the methodology used is based in the necessity to experience with greater amount of raw material or activity in the white as soon more time of irradiation, and, using a semiautomatic for the personal agent of the production of prototype is independent of specific characteristics to method for dry distillation, as: raw materials used, temperatures of distillation and gas for carry to ^{131} I. The proof to prototype are functional mechanical type, however to perfect the dry method of distillation is necessary to finish the stage of factibility to prototype. The results of proofs were in form general satisfactory waiting only to refine details and to propose the construction of a better equipment of distillation used stainless steel with completed more exacts for to garantized an useful life great to equipment and to obtain a production of ^{131} I continuously in the next years. (Author). 21 refs, 26 figs, 8 tabs.

11884 (KAERI/AR–354/92) **The core technologies for Tritium removal processes (I).** Kim, Young Ik (Korea Atomic Energy Res. Inst., Taejon (Korea, Republic of)); Sung, Ki Woong; Na, Jung Won; Jung, Heung Suk; Lee, Han Soo; Ann, Do Hee; Baik, Seung Woo. Korea Atomic Energy Research Inst., Daeduk (Korea, Republic of). Jun 1992. 48p. (In Korean). Order Number DE94618041. Source: OSTI; NTIS (US Sales Only); INIS.

In case of operating both Wolsung Nuclear Units 1 and 2 without operating tritium removal facilities, it is estimated that tritium in 2013 would be accumulated up to about 30 million Ci that would result in about 2,300 man-rem of tritium exposure to operators. The basic technologies for cryogenic distillation for tritium removal are mainly cryogenics, chemical equilibration of hydrogen isotope molecule, ortho-para hydrogen conversion, purification of hydrogen gas, electrolysis of water, recombination of water, and storage of tritium. Among them, the cryogenics, ortho-para hydrogen conversion and equilibration are the core technologies for development of tritium removal process. Establishment of these technologies through R and D in this field will contribute to localization of a tritium removal facility for Wolsung nuclear safety. (Author).

0702 Radiation Sources

Refer also to citation(s) 12779

11885 (INIS-mf–13749, pp. 88) **Laser material processing in gas turbine industries.** Mosavi, K.R. (Chromalloy Research and Technology Orangeburg, NY (United States)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 40.

Short communication. GAS TURBINES/laser beam machining; CUTTING; LASER DRILLING; LASER WELDING

11886 (INIS-mf–13792) **Use of self absorption in a radioactive gamma-source for determination of its effective thickness.** Manushev, B.; Koleva, K. Sofia Univ. (Bulgaria). Fizicheski Fakultet; National Centre of Meteorology, Sofia (Bulgaria). 1993. 7p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94619488. Source: OSTI; NTIS (US Sales Only); INIS.

A method is proposed for determination of voluminous source effective thickness by means of different absorption of gamma rays from one and the same nuclide but with different energies. The method can be useful in: measurements of voluminous sources in Marinelli- or cylinder geometries; determination of the depth of radioactive contamination penetration on some surfaces. The general formulas to realize the method and experimental results are presented. (author).

11887 (INIS-mf–13796) **The reference neutron field - a standard neutron source for neutron measurements at the research reactor IRT-2000 in Sofia.** Krezhov, K.; Christova, M.; Ruskov, I.; Jarina, V. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika; Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Fiziko-Tekhnicheskikh i Radiotekhnicheskikh Izmerenij, Moscow (Russian Federation). 1993. 10p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94616092. Source: OSTI; NTIS (US Sales Only); INIS.

A reference neutron field (RFN) is used as a standard neutron source (SNS) that is influenced by the changes in the reactor core due to recharging or other causes. A whole range of measurements is carried out in a full scope, to specify its characteristics precisely. The SNS comprises: (1) the RNF certificated to the neutron energy spectrum, its location in the reactor field, being a reference measure of the differential energy distribution in the neutron flux; (2) exposure monitoring tools (detectors revealing the certified physical characteristics); (3) functional measurement apparatus (revealing the spectral characteristics). The following basic metrological characteristics are given: differential neutron energy spectrum, described by F(E) [1/cm^2.s.MeV], normalized by 1 in the range 3-19 MeV and the measurement error; the conventional neutron flux density and its error. The methodology of measuring the neutron flux integral density comprises the following six steps: (1) assessment of the influence of the changes in the core configuration on the stability of the RNF (estimated in six energy ranges); (2) demonstration of RNF application in reactor physics studies; (3) irradiation of two sets of activation detectors (Au, Sc and Au, Sc, S in Al and Cd shields); (4) measurement of the detector activities by calibrated gamma- and beta- spectrometric apparatus; (5) determination of the neutron field characteristics at a certain point of the RNF by the method of activating ratios; (6) the result accuracy assessment and probabilistic error limits determination with 95% upper bound frequency. The RNF neutron energy range have been measured 6 times for a period of two years. 6 refs., 8 figs. (M.A.).

11888 (NPL-RSA(EXT)–34) **An intercomparison of the radium mass standards of the UK and the USSR: II.** Woods, S.A. (National Physical Lab., Teddington (United Kingdom)); Cross, P.; Christmas, P.; Kholnova, E.A.; Yudin, M.F.; Gubkin, E.S. National Physical Lab., Teddington (United Kingdom). Oct 1992. 8p. Order Number DE94618045. Source: OSTI; NTIS (US Sales Only); INIS.

Previous report with this title published as NPL-RS(EXT)–103, Jun 1988.

The National Radium Standards of the UK and the USSR have been intercompared as part of Theme 18 of the bilateral cooperation between NPL and VNIIM in the field of activity measurements. Good agreement has been obtained between the methods of measurement used. (Author).

11889 (UCRL-ID–115481) **Optimization of neutron source.** Hooper, E.B. Lawrence Livermore National Lab., CA (United States). 9 Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008280. Source: OSTI; NTIS; INIS; GPO Dep.

I consider here the optimization of the two component neutron source, allowing beam species and energy to vary. A simple model is developed, based on the earlier publications, that permits the optimum to be obtained simply. The two component plasma, with one species of hot ion (D^+ or T^+) and the complementary species of cold ion, is easy to analyze in the case of a spatially uniform cold plasma, as to good approximation the total number of hot ions is important but not their spatial distribution. Consequently, the optimization can ignore spatial effects. The problem of a plasma with both types of hot ions and cold ions is rather more difficult, as the neutron production by hot-hot interactions is sensitive to their spatial distributions. Consequently, consideration of this problem will be delayed to a future memorandum. The basic model is that used

in the published articles on the two-component, beam-plasma mirror source. I integrate the Fokker-Planck equation analytically, obtaining good agreement with previous numerical results. This simplifies the optimization, by providing a functional form for the neutron production. The primary result is expressed in terms of the power efficiency: watts of neutrons/watts of primary power. The latter includes the positive ion neutralization efficiency. At 150 keV, the present model obtains an efficiency of 0.66%, compared with 0.53% of the earlier calculation.

0703 Isotopic Power Supplies

Refer also to citation(s) 12353

0704 Economic, Industrial, and Business Aspects

Refer also to citation(s) 12696

0706 Environmental Aspects

11890 (NIRS-M–93, pp. 70-79) **Dose estimation models for environmental tritium released from fusion facilities.** Murata, Mikio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Various mathematical models are being developed to predict the behavior of HT released to the natural environment and their consequent impact. This report outlines models and the major findings of HT field release studies in France and Canada. The models are constructed to incorporate the key processes thought to be responsible for the formation of atmospheric HTO from a release of HT. It has been established from the experiments that HT oxidized in surface soil is incorporated almost entirely into soil water as HTO. This tritium may be reemitted to the atmosphere in the form of HTO through exchange of soil and atmospheric moisture as well as through the bulk water mass flux from the soil the atmosphere due to evaporation and transpiration. The direct conversion of HT to HTO in air and direct uptake of HT by vegetation are expected to be negligible for the time and space scales of interest in considering short duration releases. HTO emitted to the atmosphere is can further exchange with soil and vegetation water. Validation of these models against experimental data is conducted to demonstrate their credibility. It may be concluded that further laboratory and field works are needed in order to develop a sufficiently good understanding of the dependence of the key processes on environmental factors (including diurnal cycling and seasonality) to allow the rates of the processes to be predicted from a knowledge of environmental conditions. (author).

08 HYDROGEN

0801 Production

Refer also to citation(s) 11997, 11998, 12666

11891 (ANL/CHM/CP–81280) **Evidence for the tribochemical generation of hydrogen from higher rank coals.** Vorres, K.S. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–10: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006820. Source: OSTI; NTIS; GPO Dep.

Analysis of gases in sealed ampoules of higher rank Argonne Premium Coal Samples over a period of years has revealed the presence of significant (up to about 18%) constant amounts of hydrogen and increasing amounts of carbon dioxide. Comparison with the gas contents of sealed 55 gallon drums which have not been pulverized indicates that these gases came from activity following the collection of the samples. Several hypotheses are examined. The evidence indicates a possible tribochemical reaction involving fresh surface generated during pulverizing in the nitrogen atmosphere. It is probable that water reacts with the coal surface to release hydrogen. The oxygen from the water appears to bound to active sites, and later diffusion leads to formation and release of carbon dioxide.

11892 (DOE/MC/26367–3622) **Production of low-cost hydrogen: Final report, September 1989–August 1993.** Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States). Jun 1993. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26367. Order Number DE94000091. Source: OSTI; NTIS; GPO Dep.

Significant technical progress has been made over the last decade to develop efficient processes for upgrading coal resources to distillable hydrocarbons which may be used to displace petroleum-derived fuels. While several different direct coal liquefaction routes are under investigation, each of them have in common the need for large quantities of hydrogen to convert the aromatic coal matrix to liquid products in the normal distillation range, and for hydrotreating to improve liquid product quality. In fact, it has been estimated that the production, recovery, and efficient use of hydrogen accounts for over 50 percent of the capital cost of the liquefaction facility. For this reason, improved methods for producing low-cost hydrogen are essential to the operating economics of the liquefaction process. This Final Report provides an assessment of the application of the MTCI indirect gasification technology for the production of low-cost hydrogen from coal feedstocks. The MTCI gasification technology is unique in that it overcomes many of the problems and issues associated with direct and other indirectly heated coal gasification systems. Although the MTCI technology can be utilized for producing hydrogen from almost any carbonaceous feedstock (fossil, biomass and waste), this report presents the results of an experimental program sponsored by the Department of Energy, Morgantown Energy Research Center, to demonstrate the production of hydrogen from coal, mild gasification chars, and liquefaction bottoms.

11893 (UCRL-JC–114495) **Scenarios for multi-unit inertial fusion energy plants producing hydrogen fuel.** Logan, B.G. Lawrence Livermore National Lab., CA (United States). Dec 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931048–6: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94006614. Source: OSTI; NTIS; INIS; GPO Dep.

This work describes: (a) the motivation for considering fusion in general, and Inertial Fusion Energy (IFE) in particular, to produce hydrogen fuel powering low-emission vehicles; (b) the general requirements for any fusion electric plant to produce hydrogen by water electrolysis at costs competitive with present consumer gasoline fuel costs per passenger mile, for advanced car architectures meeting President Clinton's 80 mpg advanced car goal, and (c) a comparative economic analysis for the potential cost of electricity (CoE) and corresponding cost of hydrogen (CoH) from a variety of multi-unit IFE plants with one to eight target chambers sharing a common driver and target fab facility. Cases with either heavy-ion or diode-pumped, solid-state laser drivers are considered, with "conventional" indirect drive target gains versus "advanced, e.g. Fast Ignitor" direct drive gain assumptions, and with conventional steam balance-of-plant (BoP) versus advanced MHD plus steam combined cycle BoP, to contrast the potential economics under "conventional" and "advanced" IFE assumptions, respectively.

0804 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11893

09 BIOMASS FUELS

Refer also to citation(s) 12348, 12349

11894 (NEI-FI–214) **Biofuels workshop II: Proceedings.** Alakangas, E. (ed.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. 409p. (CONF-9208243–: 2. workshop on biofuels, Espoo (Finland), 24-30 Aug 1992). Order Number DE94722037. Source: OSTI; NTIS.

This publication contains the presentations held in the Biofuels workshop II, arranged by the Finnish Ministry of Trade and Industry and the United States Department of Energy. The scope of the second workshop included all aspects of research and development of liquid biofuels, and biomass production and utilization. The workshop consisted of plenary session and two parallel sessions; Liquid biofuels, and Biomass production and utilization. The content of the workshop was following: The Plenary Session: The Finnish energy strategy; Development and using clean domestic fuels - a slide presentation; New Bioenergy programme in Finland; U.S. Biofuels program - a slide presentation; Liquid biofuels session: Fuel ethanol for oxygenated gasoline in Finland; Alcohols and ethers for improving air quality; Agricultural programs for energy - High margin coproducts strategy; Biodegradable lubricants; The effect of biofuel production on Finnish CO_2 balance; 'Biomass production and utilization' session: Integrated harvesting for pulp chips and fuels from whole tree raw material; Research on short rotation forestry in Finland - Interim results; Wood fuel utilization in California; Role of biofuels in Finland, Utility viewpoint; On-site power generation for the future; Industrial waste sludge combustion in fluidized bed boiler; Bubbling fluidized bed boiler for biofuel combustion; Combustion research of biomass in Finland; Thermochemical conversion research in the U.S. Department of Energy biofuels and power programs; Technology development and commercialization of the RENUGAS process; Pressurized CFB biomass gasification - the Vaernamo demonstration plant.

0908 Production

Refer also to citation(s) 13195

11895 (NEI-FI–214, pp. 157-176) **Integrated harvesting for pulp chips and fuel from whole tree material.** Asplund, D. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The potential of wood fuels in Finland, the new MASSAHAKE method, and the experimental line research results have been presented in this presentation. The method is based on harvesting and chipping of the whole wood biomass. The pulp and fuel fractions are separated after chipping using a special chip cleaning line. The preliminary calculations show that fuel fraction produced with the MASSAHAKE method would be competitive with coal and other fossil fuels. In some cases fuel fraction could be even 5.0 USD/MWh cheaper than coal (10.0 USD/MWh). Utilization of wood fuels in energy production has no net increase in the CO_2 emissions to the atmosphere, and they contain very little of harmful elements such as sulfur. This research with continuous MASSAHAKE experimental line showed that the method could be commercialized within a relatively short time. The fuel fraction, formed in the chip cleaning process, can be used at power plants using present combustion technology. The future potential of this method in energy production was estimated by calculating two examples with new power generation solution. In these case-examples fuel fraction is used as fuel in gas turbine process after pressurized gasification. According to the examples within pulp and paper industry using the MASSAHAKE method, the power generation would be increased by even more than 100 % from the present level. The total purchased electric power in pulp and paper manufacture in Finland would decrease from the present 11.0 TWh/a to 4.0 TWh/a in the case of total utilization of the MASSAHAKE method.

11896 (NEI-FI–214, pp. 177-197) **Research in short rotation forestry in Finland - Interim results.** Hytoenen, J. (Finnish Forest Research Institute, Kannus (Finland). Kannus Research Station). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The concept of short-rotation management includes the establishment of closely-spaced, fast-growing trees and the application of intensive cultivation practices, repeated harvesting using short cutting cycles, regeneration of subsequent crops via sprouts or suckers, and the use of a high degree mechanization. The establishment and management of willow biomass plantations as well as the production and technical quality of the produced biomass have been studied in Finland. Marginal lands (e.g. depleted peat extraction sites) often require costly amelioration measures in the form of liming and annual fertilization. The growth responses of trees, especially to nitrogen fertilization, have been high. The most promising production results have been obtained on good agricultural soils in southern Finland. The highest above-ground biomass yields recorded in experimental plantations have been 10-15 tons/ha/a (oven-dry mass). The yields from the second harvest have been higher than those at the end of the first rotation. Rotations of 3-6 years have given the best yields. Short-rotation forestry could offer an alternative use for agricultural lands and thus reduce the problem of surplus production in agriculture. However, economic calculations include many uncertainties. Harvesting and storage are critical financial stages as they represent over 30 % of the total costs. The present knowledge of the general cultivation regime is adequate. Significant advantages can be made in selection and breeding, optimization of spacing and rotation length, harvesting and coppice physiology. Large-scale demonstration plantations are also needed.

0909 Processing

Refer also to citation(s) 11915, 11916, 13138

11897 (ANL/CMB/PP–81754) **Characterization of the glycolytic enzyme enolase which is abundant in the hyperthermophilic archaeon, Pyrococcus furiosus.** Peak, M.J. (Argonne National Lab., IL (United States)); Peak, J.G.; Stevens, F.J.; Blamey, J.; Mai, X.; Zhou, Z.H.; Adams, M.W.W. Argonne National Lab., IL (United States). [1993]. 46p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant N00014-90-J-1894. Order Number DE94006835. Source: OSTI; NTIS; GPO Dep.

High enolase activity, as measured by the conversion of 2-phosphoglycerate to phosphoenolphyruvate, was found in the cytoplasm of Pyrococcus (an anaerobic, hyperthermophilic archaeon that grows optimally at 100°C). In this organism, the enzyme probably functions in a sugar fermentation pathway. The enzyme was purified to homogeneity. It had a temperature optimum of >90 °C, and a pH optimum of 8.1. The enzyme was extremely thermostable with a half time for inactivation at 100°C of 40 min. In contrast, an enolase from yeast was inactivated in 1 min at 88°C. Both the P. furiosus and yeast enzymes required a metal ion for activity, but whereas the yeast enzyme has an absolute requirement for Mg^{++} the P. furiosus enolase was equally active in the presence of Mn^{++}. Both enzymes were competitively inhibited by citrate. P. furiosus enolase, as for mesophilic enolases, probably has a homodimeric structure with subunit M_r greater than 45,000. A highly conserved sequence of eight amino acids in the N-terminal region was found in enolases from P. furiosus and a wide range of other organisms including bacteria, yeast, birds, and mammals.

11898 (DOE/ER/14003–3) **Effect of community structure on the kinetics of anaerobic degradation of aromatic compounds: Progress report, March 1989–June 1991.** McInerney, M.J. Oklahoma Univ., Norman, OK (United States). Dept. of Botany and Microbiology. Jun 1991. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER14003. Order Number DE94005677. Source: OSTI; NTIS; GPO Dep.

The physiology of fatty acid metabolism and the kinetics of benzoate degradation by anaerobic syntrophic bacteria were studied.

We have shown that: a threshold for benzoate degradation by a syntrophic coculture of Syntrophus buswellii and Desulfovibrio strain G11 exists and the value of the threshold depends on the amount of benzoate and acetate suggesting a thermodynamic limitation. Syntrophomonas wolfei has the enzymatic ability to produce formate and that low levels of formate are made during growth in pure culture with crotonate or in coculture with butyrate. However, the high specific activities of hydrogenase compared to formate dehydrogenase indicate that hydrogen rather than formate is the intermediate involved in the interspecies transfer of reducing equivalents. We have isolated Syntrophus buswellii and a novel anaerobic bacteria that catalyzes an aryl-ether cleavage reaction using crotonate as the energy source. Several novel obligately halophilic anaerobes from hypersaline oil reservoir brines were isolated and characterized. Two of these degraded pyrogallate with the production of acetate. We have shown that S. wolfei synthesizes poly-βhydroxyalkanoate (PHA) by two routes, directly from a β-oxidation intermediate without cleaving a C-C bond and by the condensation of two acetyl-CoA molecules. The formation of D-3-hydroxyacyl-CoA needed for PHA synthesis occurs by the activity of a acetoacetyl-CoA reductase rather than a enoyl-CoA hydratase. The genes for PHA synthesis in S. wolfei have been cloned into Escherichia coli.

11899 (DOE/ER/20022–T1) **Towards a detailed understanding of the structural variability in lignins: A new approach: Progress report, April 1991–June 1993.** Lewis, N.G.; Towers, G.H.N. Washington State Univ., Pullman, WA (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-91ER20022. Order Number DE94007449. Source: OSTI; NTIS; GPO Dep.

This reporting period witnessed a number of exciting and important breakthroughs in the study of lignin synthesis in plants and resulted in a significant deviation from the work plan originally proposed. Taken together, the authors' results reveal an emerging picture of a highly ordered assembly of the lignin polymer at the plasma membrane/cell-wall interface, in contrast to original considerations projecting a random series of coupling reactions. The Progress Report is divided into two sections: the first section reflects the interlocking research completed to date in the laboratories of N.G. Lewis and G.H.N. Towers. In the broadest sense, the Lewis group has focused mainly on woody plants, whereas the Towers laboratory examined similar processes in cereals/grasses. The second section compiles published work, a summary of manuscripts in preparation, and work currently underway for year three of the existing grant.

11900 (DOE/FTR–94003548) **Sardinia 1993 Fourth International Landfill Symposium, including meeting of International Energy Agency (IEA) Expert Working Group (EWG) on Landfill Gas: Foreign trip report, October 9–16, 1993.** Bogner, J.E. Argonne National Lab., IL (United States). 15 Nov 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94003548. Source: OSTI; NTIS (US Sales Only); GPO Dep.

J.E. Bogner traveled to Sardinia to participate in the Fourth International Landfill Symposium (Sardinia '93) organized by CISA, the Environmental Sanitary Engineering Center of the University of Cagliari, under the auspices of ISWA, the International Solid Waste Association. The major purposes of this trip were to attend a meeting of the International Energy Agency (IEA)-Expert Working Group (EWG) on Landfill Gas, to present a paper on NREL-sponsored landfill gas research, and to gain knowledge of international landfilling activities and landfill gas development through participation in the conference.

11901 (Juel–2679) **Continuous production of mineral-oil-degrading bacteria for use in biotechnological land decontamination.** Rohns, H.P. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Biotechnologie; Technische Hochschule Aachen (Germany). Sep 1992. 126p. (In German). Order Number DE94747577. Source: OSTI; NTIS (US Sales Only).

A method for producing a mineral-oil-degrading bacterial biomass with optimum biomass productivity and, simultaneously, a maximum substrate degradation capacity was developed. As continuous processes, a two-stage reactor cascade and a single-stage culture system with external biomass recirculation were chosen and set up on a laboratory scale. The population in the two-stage reactor cascade was composed of mainly six different bacterial cultures, independently of the test conditions chosen. Screening of the pure bacterial cultures for their utilization of different mineral oil constituents showed a great potential for hydrocarbon degradation. In the additionally used culture system with external biomass recirculation, where the hydraulic dilution rate of the substrate (D=0.06 h^{-1}) was decoupled from the rate of microbial growth (μ=0.017 h^{-1}), biomass productivity could be increased to 16.8 mgDS/lh at nearly complete substrate degradation. (orig./EF)

11902 (NEI-FI–214, pp. 339-376) **Thermochemical conversion research in the U.S. Department of Energy biofuels and power programs.** Overend, R.P. (National Renewable Energy Lab., Golden, CO (United States)); Chum, H.L. Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

With proper resource management and through the development of efficient conversion processes, biomass could contribute as much as 20 % of current U.S. energy consumption by 2030; i.e. 4-5 times today's 3.8 quads, as estimated for the National Energy Strategy. This can only be obtained through the conversion of biomass into efficient secondary energy forms such as electricity and liquid fuels (ethanol, methanol, and oxygenates). Methanol, oxygenates, and electricity are produced through thermochemical conversion processes such as gasification, liquefaction, and combustion. Biomass already constitutes a significant resource for producing electricity. In 1989, biomass- and municipal-solid-waste-powered facilities provided a generation capacity of almost 8.4 GWe.

11903 (NEI-FI–214, pp. 377-392) **Technology development and commercialization of the RENUGAS process biofuels and power programs.** Gissy, J. (Institute of Gas Technology, Chicago, IL (United States)); Knight, R.A.; Onischak, M; Carty, R.H.; Babu, S.P. Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The RENUGAS process is a pressurized fluidized bed biomass thermal gasification process developed by the Institute of Gas Technology (IGT). During the past few years, it has been proven successfully at the process development unit (PDU) scale using bagasse. The objective of the IGT PDU test program was to determine the gasification characteristics of bagasse that will constitute the basis for scale-up to the 100 tons/d. demonstration unit to be built by PICHTR at the Havaiian Commercial and Sugar Company plant at Paia, Maui. The IGT RENUGAS PDU is a fluidized bed gasifier with a nominal capacity of 12 tons/d. of biomass feed. The entire unit is over 50 feet high. The feed hopper and associated solids-handling equipment are designed for continuous feeding to the pressurized gasifier. The piping between the gasifier and the cyclone, as well as the piping between the cyclone and the downstream water spray quench, is refractory-lined carbon steel pipe. Partial quenching of the hot product gases downstream of the cyclone reduces the gas temperature to about 800 deg F before the product gas is flared. The author discusses in this presentation also the gas sampling equipment and procedure, the bagasse handling and characterization, the PDU system modifications, the PDU test procedure and the test results, and reviews the possibilities to commercialize the technology.

11904 (NEI-FI–214, pp. 393-409) **Pressurized CFB biomass gasification - the Vaernaemo demonstration plant.** Lundqvist, R.G. (Ahlstroem A. Oy, Karhula (Finland). Hans Ahlstroem Lab.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission

reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The increasing concern about the greenhouse effect as well as the cost of energy have resulted in development of the already known or new very efficient energy production technologies where the impact on the nature is minimized in a cost-effective way. The integrated gasification combined cycle (IGCC) system has been proposed as one of the high efficiency technologies that can assist in reducing the CO_2 emission. This is especially true if renewable biomass fuels like wood waste and forest residues are used as a feedstock. A Ahlstroem Corp. from Finland and Sydkraft AB from Sweden decided to develop jointly the IGCC technology using biomass as fuel. A joint venture company, Oy Bioflow Ab, was established to market and develop the technology. As an essential part of this cooperation between the companies is the construction of a demonstration plant at the city of Vaernamo in southern Sweden. The plant, which will generate 6 MW of electricity and 9 MW of district heat is based on AHLSTROeM PYROFLOW circulating fluidized bed technology. Plant commissioning starts in the spring 1993. The Bioflow technology, the Vaernamo demonstration plant and other development work is discussed in this paper.

0910 Properties and Composition

11905 (NEI-FI–214, pp. 145-146) **Biodegradable lubricants.** Linden, K.E. (Raisio Group, Raisio (Finland). Oil Milling Industry). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Short communication LUBRICATING OILS/biodegradation; BIODEGRADATION; LUBRICATING PROPERTIES; SEEDS; FRICTION; VISCOSITY; VEGETABLE OILS

0920 Combustion

Refer also to citation(s) 11528, 11910

11906 (NEI-FI–214, pp. 227-286) **On-site power generation for the future.** McCarroll, R.L. (Power Generating Inc., Fort Worth, TX (United States)); Partanen, W.E. Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Power Generating Inc. is developing a direct-fired gas turbine power system designed to operate on solid fuel. This presentation will summarize the results of the development work performed to date and will outline the program currently underway to demonstrate the technical and economic viability of a gas turbine fired on white wood and subsequently on coal. The presentation will describe testing already completed on a pressurized suspension burner which forms the external combustion stage for the solid fuel fired gas turbine and the testing that has been done on various fuels categorized as acceptable 'fuels of choice' for the project. Also to be covered will be a discussion of the equipment to be used in the demonstration project, the reasons why specific pieces of equipment have been selected, and how they might be modified for the gas turbine application. Potential worldwide markets and ongoing development strategies for the gas turbine power system will also be discussed.

11907 (NEI-FI–214, pp. 287-304) **Industrial waste sludge combustion in fluidized bed boiler.** Kojo, I.V. (Outokumpu EcoEnergy, Espoo (Finland). Technical Dept.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The amount of industrial sludge, which will not be allowed to be dumped in the future in refuse tips any more, is increasing. One solution for this problem is to burn the sludge in order to stabilize the waste, minimize the volume of it and to get benefit of the energy content of the sludge. Fluidized bed technology has proven to be an effective and safe method for combustion of sludge, the heat value of which is often so low that it cannot be burned in other combustion processes. Besides the heat value, the high ash and moisture contents, the sludges can be problematic in other ways too. Very often waste sludge form a potential environmental risk because of their high impurity content, so dumping of them will not be allowed. The high impurity content, e.g. the heavy metal content and possible organic constituents must also be taken into account in designing of a combustion process. Most of the emissions can be prevented by using effective combustion technology, but in some cases some more effective, selective secondary gas cleaning systems must be used. Outokumpu EcoEnergy has designed and installed fluidized bed boilers since 1977. Many of the boilers installed recently are aimed to burn sludge in order to benefit the heating value of the sludge and to incinerate the waste material.

11908 (NEI-FI–214, pp. 305-322) **Bubbling fluidized bed boiler for biofuel combustion.** Niittymaeki, I. (Tampella Power Inc., Tampere (Finland). Boiler Industry). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

As pulp and paper mills all over the world invest in increased capacity, the quantity of the mill wastes will continue to increase. New paper machine installations or process modifications for using deinked mass will significantly increase the quantities of biomass (bark, wood, waste and sludge). The disposal of sludge is a serious and expensive problem. Not only is the government restricting industrial landfilling and land farming, but the industry is reluctant to invest in long term liability associated with land disposal. European pulp and paper companies have turned to bubbling fluidized bed boilers (BFB) for biofuel combustion. In Finland where fluidized bed boilers burning biofuels were introduced, the grate fired biofuel combustion applications have effectively been replaced with fluidized bed boilers. The bubbling fluidized bed technology is also introduced to USA to help North American pulp and paper industry in their struggle to creatively deal with biomass waste disposal. The basic design of the fluidized bed boiler and its advantages are discussed and examples for both new and retrofit units are provided in this presentation.

11909 (NEI-FI–214, pp. 323-337) **Combustion research of biomass in Finland.** Huotari, J. (Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Combustion research of biomass fuels includes wood and peat based fuels and to a small extent municipal solid wastes as well. Several peat fuels e.g. milled peat, sod peat, peat briquettes and peat pellet, have been concerned. Not all of them are currently commercial. Wood based fuels include logs, chips, wood wastes of forest industry, non-commercial pellets and black liquor. The distribution of boiler capacity of the biomass fuels is described in this presentation. The reactivities of the biomass fuels and emissions, especially the formation of them in the combustion process, as well as the diagnostic applications, are presented. The author also presents the space heating furnaces, the emissions of them, and the catalytic reduction of emissions, especially carbon monoxide emissions. He also gives a short overview on district heating boilers suitable for combustion of biomass fuels, as well as the development of low-NO_x technologies for power plant boilers, and the pressurized combustion trials.

0930 Economic, Industrial, and Business Aspects

Refer also to citation(s) 13221

11910 (DOE/CH/10093–257) **Biomass power industry: Assessment of key players and approaches for DOE and industry interaction.** National Renewable Energy Lab., Golden, CO (United States). Jan 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000238. Source: OSTI; NTIS; GPO Dep.

A review team established by the Department of Energy conducted an assessment of the US biomass power industry. The review team visited with more than 50 organizations representing all sectors of the biomass power industry including utilities, independent power producers, component manufacturers, engineering and construction contractors, agricultural organizations, industrial users, and regulatory organizations. DOE solicited industry input for the development of the Biomass Power Division's Five Year Plan. DOE believed there was a critical need to obtain industry's insight and working knowledge to develop the near- and long-term plans of the program. At the heart of this objective was the desire to identify near-term initiatives that the program could pursue to help accelerate the further development of biomass power projects.

11911 (NEI-FI–214, pp. 199-216) **Wood fuel utilization in California.** Hartsough, B.R. (California Univ., Davis, CA (United States). Biological and Agricultural Engineering Dept.). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

About a quarter of California's primary energy consumption is used to produce electricity. At present more than 900 MW, representing 4-5 % of the total electric power, is currently generated with fuels derived from wood or agricultural residues. This represents an order of magnitudes increase in the use of these biomass fuels over a period of a decade. The increase are results of the Public Utilities Regulatory Policy Act (PURPA) of 1978, as implemented in California. Prior to PURPA, most wood fuel was used by the forest products industry to generate process steam in low pressure boilers, although some of the larger facilities cogenerated electricity for internal use. PURPA required utilities to purchase power from small alternative producers at full incremental avoided costs. In 1983, the California Public Utilities Commission adopted an option, which provided long-term fixed prices for electricity. These prices, although 10-15 % lower than the avoided costs at the time, were in retrospect very favourable. Many small producers signed contracts, with the result that the additional capacity exceeded what the utilities could use. Facilities permitted under this offer had five years to complete construction. Due to the drop in avoided costs of the utilities and high current costs for biomass fuels, no new plants are expected for many years.

11912 (NEI-FI–214, pp. 217-226) **Role of biofuels in Finland; Utility viewpoint.** Salminen, P. (Imatran Voima Oy, Vantaa (Finland)). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The use of wood biomass in Finland to generate energy (4.3 Mtoe) is one of the largest in the western industrialized countries. It represents 14 % of the primary energy use, while the use of peat for energy generation (1.4 Mtoe), often included in the same group, makes up 4-5 %. Significant energy groups include bark and sawdust (0.95 Mtoe) and waste liquors (2.4 Mtoe) from the chemical forest industry. Peat has primarily been used in population centres and by industry for combined generation of heat and power. The utilization of own by-products and other back-pressure generation based on peat or on imported fuels (in southern Finland), is typical for the industrial power plants. Wood biomass utilization will also be competitive in the future if it is readily collected in sufficient quantities at a given place as waste wood for industry. These biomasses include bark, various sawdusts, industrial waste chips and screenings, and as a separate group black liquor in the process circulation of the wood processing industry. The development of fluidized bed boilers in particular has provided improvement prerequisites for the use of low grade fuel batches of varying quality in combined heat and power plants. Most of the combined heat and power plants now built in Finland exceed the limit set for the competitiveness. Consequently, the prospects for an economical increase of combined heat and power generation capacity in Finland based on present technology is relatively small. The size of a competitive power plant has been determined to be about 50 MWe.

0950 Environmental Aspects

Refer also to citation(s) 11905, 11914

11913 (NEI-FI–214, pp. 147-155) **The effect of liquid biofuel production on Finnish CO_2 balance.** Gust, S. (Neste Oy, Porvoo (Finland)). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Production of liquid biofuels utilizing wood from either forestry residues or in the future, from energy farms, and converted into methanol or pyrolysis oil have the potential to reduce Finland's net CO_2 emissions by 5-10 % from existing levels for wood volumes from 3.5-7.0 Mt/a. The reduction of national CO_2 emissions by ethanol produced from barley or rapeseed oil methyl esters from rapeseed will be limited to under 1.0 %. This is due to: Greater CO_2 emissions from biomass production of barley and rapeseed than from wood; greater CO_2 emissions from conversion of barley into ethanol and biomass volume limitations due to either lack of suitable land and/or domestic market limits of animal feed coproducts.

0960 Health and Safety

Refer also to citation(s) 12104

11914 (ETDE-IT–94-33) **Waste processing plant eco-auditing system for minimization of environmental risk: European Communities regulatory proposal.** Brunetti, N. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Villarini, M. No corporate text available. 1993. 12p. (In Italian). (CONF-9302165–1: Meeting on Municipal and industrial wastes, Milan (Italy), 9-10 Feb 1993). Order Number DE94752633. Source: OSTI; NTIS (US Sales Only); INIS.

This paper delineates a system of process control and monitoring checks to be applied to municipal-industrial waste processing and disposal plants to ensure their energy efficient, environmentally safe and reliable operation. In line with European Communities environmental protection strategies, this eco-auditing system requires the preparation of environmental impacts statements on a regular basis during plant operation, as well as, prior to plant start-up. Continuous plant environmental compatibility evaluations are to ascertain: material and energy inputs and outputs; the composition and amounts of exhaust gases released into the atmosphere and the integrity of treatment liquids; control and monitoring instrumentation reliability. The implementation of the auditing system is to be carried out under the supervision of authorized auditing personnel. Waste processing and disposal plants are to make maximum use of energy and materials recovery processes so as to minimize energy consumption and risk to the environment.

0970 Legislation and Regulations

Refer also to citation(s) 12346

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 11445, 11446, 11595, 12677

11915 (DOE/MC/27225–3625) **Biological conversion of synthesis gas: Final report, August 31, 1990–September 3, 1993.** Basu, R.; Klasson, K.T.; Johnson, E.R.; Takriff, M.; Clausen, E.C.; Gaddy, J.L. Arkansas Univ., Fayetteville, AR (United States). Sep 1993. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-90MC27225. Order Number DE94000094. Source: OSTI; NTIS; GPO Dep.

Based upon the results of this culture screening study, Rhodospirillum rubrum is recommended for biocatalysis of the water gas shift reaction and Chlorobium thiosulfatophilum is recommended for H_2S conversion to elemental sulfur. Both bacteria require tungsten light for growth and can be co-cultured together if H_2S conversion is not complete (required concentration of at least 1 ppM), thereby presenting H_2 uptake by Chlorobium thiosulfatophilum. COS degradation may be accomplished by utilizing various CO-utilizing bacteria or by indirectly converting COS to elemental sulfur after the COS first undergoes reaction to H_2 in water. The second alternative is probably preferred due to the low expected concentration of COS relative to H_2S. Mass transfer and kinetic studies were carried out for the Rhodospirillum rubrum and Chlorobium thiosulfatophilum bacterial systems. Rhodospirillum rubrum is a photosynthetic anaerobic bacterium which catalyzes the biological water gas shift reaction: $CO + H_2O \rightarrow CO_2 + H_2$. Chlorobium thiosulfatophilum is also a photosynthetic anaerobic bacteria, and converts H_2S and COS to elemental sulfur.

11916 (DOE/MC/27225–3656) **Biological conversion of synthesis gas: [Quarterly] project status report, July 1, 1992–September 30, 1992.** Arkansas Univ., Fayetteville, AR (United States). 1 Oct 1992. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-90MC27225. Order Number DE94007385. Source: OSTI; NTIS; GPO Dep.

The anaerobic, photosynthetic bacterium Chlorobium thiosulfatophilum is able to convert H_2S and COS in synthesis gas to elemental sulfur. The bacterium grows on CO_2 as its carbon source at 30°C. In the absence of sulfide, the formed elemental sulfur is converted to sulfate. Thus, bioreactor designs must incorporate sulfur removal as an integral part of the bioprocess. In this initial study, C. thiosulfatophilum was used to convert H_2S to elemental sulfur in a continuous stirred tank reactor with continuous gas and liquid feed. Sulfur removal was not part of this initial system design, but will be an added feature in future work. The gas used in this study contained 2.52 percent H_2S, 10.00 percent CO_2, 14.99 percent CH_4 and 72.49 percent He. The liquid flow rate to the 1380 mL reactor volume ranged from 10.8–23.6 mL/min and was a variable in the study. The initial gas flow rate was 11.6 standard mL/min, although it was also changed twice during the study. The temperature was maintained at 31°C and the agitation rate was held at 200 rpm in the Bioflo reactor. Cell density was monitored by the chlorophyl method and gas composition was monitored by gas-solid chromatography. Light at 2200 lux was supplied using two 40W tungsten light bulbs on the outside of the glass reactor vessel.

11917 (DOE/MC/29228–3670) **Selective methane oxidation over promoted oxide catalyst: Quarterly report, September–November 1993.** Klier, K.; Herman, R.G.; Sarkany, J.; Sun, Q. Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry. Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-92MC29228. Order Number DE94004086. Source: OSTI; NTIS; GPO Dep.

Dispersed metal oxide catalysts have been prepared and tested for selective oxidation of methane. The catalysts were based on multivalent cations impregnated into a number of different oxide supports: MoO_3/SiO_2, V_2O_5/SiO_2, $V_2O_5/MoO_3/SiO_2$, V_2O_5/TiO_2, SnO_2/SiO_2, and V_2O_5/SnO_2. Among the dispersed metal oxide catalysts studied this quarter, the most active catalyst was clearly the V_2O_5/SiO_2 catalyst. High surface area silica samples impregnated with 1–5 wt% V_2O_5 were found to be active catalysts with low selectivity toward CO_2. Although CO was the major product, appreciable selectivities toward formaldehyde were also observed. Indeed, with the V_2O_5/SiO_2 catalysts, very high space time yields of formaldehyde of > 1 kg CH_2O/kg catal/h could be obtained even though conventional single pass %yields were <2%. These results were obtained at relatively high GHSV (70,000–280,000 *l*/kg catal/h) but moderate temperatures (530–630C).

11918 (DOE/PC/92108–T5) **Technology development for cobalt F-T catalysts: Quarterly technical progress report No. 4, July 1, 1993–September 30, 1993.** Singleton, A.H. Energy International Corp., Pittsburgh, PA (United States). 14 Dec 1993. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92108. Order Number DE94008386. Source: OSTI; NTIS; GPO Dep.

The goal of this project is the development of a commercially viable, cobalt-based Fischer-Tropsch (F-T) catalyst for use in a slurry bubble column reactor. Cobalt-based catalysts have long been known as being active for F-T synthesis. They typically possess greater activity than iron-based catalysts, historically the predominant catalyst being used commercially for the conversion of syngas based on coal, but possess two disadvantages that somewhat lessen its value: (1) cobalt tends to make more methane than iron does, and (2) cobalt is less versatile with low H2/CO ratio syngas due to its lack of water-gas shift activity. Therefore, the major objectives of this work are (1) to develop a cobalt-based F-T catalyst with low (< 5 %) methane selectivity, (2) to develop a cobalt-based F-T catalyst with water-gas shift activity, and (3) to combine both these improvements into one catalyst. It will be demonstrated that these catalysts have the desired activity, selectivity, and life, and can be made reproducibly. Following this experimental work, a design and a cost estimate will be prepared for a plant to produce sufficient quantities of catalyst for scale-up studies.

11919 (DOE/PC/92117–T6) **Bioconversion of coal derived synthesis gas to liquid fuels: Final quarterly technical progress report, July 1, 1993–September 30, 1993.** Jain, M.K.; Worden, R.M.; Grethlein, H. Michigan Biotechnology Inst., Lansing, MI (United States). 25 Oct 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92117. Order Number DE94008330. Source: OSTI; NTIS; GPO Dep.

The overall objective of the project is to develop an integrated two stage fermentation process for conversion of coal-derived synthesis gas to a mixture of alcohols. This is achieved in two steps. In the first step, Butyribacterium methylotrophicum converts carbon monoxide (CO) to butyric and acetic acids. Subsequent fermentation of the acids by Clostridium acetobutylicum leads to the production of butanol and ethanol. The tasks for this quarter were: (1) development/isolation of superior strains for fermentation of syngas, (2) optimization of process conditions for fermentation of syngas, (3) evaluation of bioreactor configuration for improved mass transfer of syngas, (4) development of a membrane-based pervaporation system, (5) optimization of process conditions for reducing carbon and electron loss by H_2-CO_2 fermentation, and (6) synthesis gas fermentation in single-stage by co-culture. Progress is reported in isolation of CO utilizing anaerobic strains; investigating the product profile for the fermentation of syngas by B. methylotrophicum; and determining the effect of carbon monoxide on growth of C. acetobutylicum.

11920 (EUR–13541, pp. 101-111) **Reversed flow synthesis of methanol.** Jochems, J. Commission of the European Communities, Luxembourg (Luxembourg). 1991. JOUE-0032-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The aim of the project is to evaluate a new reversed flow technology for the production of methanol. It includes: non-pseudo steady-state evaluation of the reaction kinetics, bench-scale testing of the methanol synthesis under reversed flow conditions for reaction modelling and testing of catalyst behaviour, combination of the (transient) reaction kinetics and the reactor model for simulating the entire reversed flow methanol process, technical-economic process evaluation, estimation of energy savings, compared with the

conventional methanol synthesis process. An energy saving of 5 to 10 pc compared to present methanol processes is expected.

13 HYDRO ENERGY

11921 (DOE/BPA–2000) **Daily/hourly hydrosystem operation: How the Columbia River system responds to short-term needs.** USDOE Bonneville Power Administration, Portland, OR (United States); Corps of Engineers, Portland, OR (United States). North Pacific Div.; Bureau of Reclamation, Boise, ID (United States). Pacific Northwest Region. Feb 1994. 51p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007590. Source: OSTI; NTIS; GPO Dep.

The System Operation Review, being conducted by the Bonneville Power Administration, the US Army Corps of Engineers, and the US Bureau of Reclamation, is analyzing current and potential future operations of the Columbia River System. One goal of the System Operations Review is to develop a new System Operation Strategy. The strategy will be designed to balance the many regionally and nationally important uses of the Columbia River system. Short-term operations address the dynamics that affect the Northwest hydro system and its multiple uses. Demands for electrical power and natural streamflows change constantly and thus are not precisely predictable. Other uses of the hydro system have constantly changing needs, too, many of which can interfere with other uses. Project operators must address various river needs, physical limitations, weather, and streamflow conditions while maintaining the stability of the electric system and keeping your lights on. It takes staffing around the clock to manage the hour-to-hour changes that occur and the challenges that face project operators all the time.

1301 Resources and Availability

Refer also to citation(s) 13056

11922 (DOE/ID–10430(AR)) **US hydropower resource assessment for Arkansas.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007506. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Arkansas.

11923 (DOE/ID–10430(KS)) **US hydropower resource assessment for Kansas.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007507. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Kansas.

11924 (DOE/ID–10430(LA)) **US hydropower resource assessment for Louisiana.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007508. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Louisiana.

11925 (DOE/ID–10430(MO)) **US hydropower resource assessment for Missouri.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007509. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Missouri.

11926 (DOE/ID–10430(MT)) **US hydropower resource assessment for Montana.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007510. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Montana.

11927 (DOE/ID–10430(ND)) **US hydropower resource assessment for North Dakota.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007511. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this

purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of North Dakota.

11928 (DOE/ID–10430(OK)) **US hydropower resource assessment for Oklahoma.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007512. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose, The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Oklahoma.

11929 (DOE/ID–10430(SD)) **US hydropower resource assessment for South Dakota.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007513. Source: OSTI; NTIS; GPO Dep.

A total of 33 sites have been identified and assessed for their hydropower potential. Information as to the potential megawatts of capacity for 4 of the sites was not available; however, these sites have been identified as having hydropower potential and are included in the group of 33. The Hydropower Evaluation Software results for site capacities range from 35 kilowatts to 234 megawatts. Most of the sites have potential capacities of under 1 megawatts. The unadjusted hydropower potential for South Dakota was identified as being 1,124 megawatts. The Hydropower Evaluation Software results lower this estimate 38% to 695 megawatts. The greatest reduction in undeveloped potential occurs at developed sites with current power production. These sites have a Hydropower Evaluation Software estimated capacity of 285 megawatts, a 50% reduction in capacity. The number of sites does not change, only the identified capacity is reassessed.

11930 (DOE/ID–10430(TX)) **US hydropower resource assessment for Texas.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007514. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Texas.

11931 (DOE/ID–10430(UT)) **US hydropower resource assessment for Utah.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 382p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007515. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Utah.

11932 (DOE/ID–10430(WY)) **US hydropower resource assessment for Wyoming.** Francfort, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Dec 1993. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007516. Source: OSTI; NTIS; GPO Dep.

The Department of Energy is developing an estimate of the hydropower development potential in this country. The Hydropower Evaluation Software (HES) is a computer model that was developed by the Idaho National Engineering Laboratory for this purpose. The HES measures the potential hydropower resources available in the United States, using uniform criteria for measurement. The software was developed and tested using hydropower information and data provided by the Southwestern Power Administration. It is a dBASE menu-driven software application that allows the personal computer user to assign environmental attributes to potential hydropower sites, calculate development suitability factors for each site based on the environmental attributes present, and generate reports based on these suitability factors. This report details the resource assessment results for the state of Wyoming.

1306 Environmental Aspects

11933 (DOE/BP/02737–4) **Research to identify effective antifungal agents: Annual report 1993.** Schreck, C.B. (Oregon State Univ., Corvallis, OR (United States). Oregon Cooperative Fisheries Research Unit); Fitzpatric, M.S.; Chitwood, R.L.; Marking, L.L.; Rach, J.J.; Schreier, T.M. Oregon State Univ., Corvallis, OR (United States). Oregon Cooperative Fishery Research Unit; National Fisheries Research Center, La Crosse, WI (United States). Oct 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI79-89BP02737. Order Number DE94005639. Source: OSTI; NTIS; GPO Dep.

Use of malachite green as a fungicide in fish culture was terminated by the Food and Drug Administration (FDA) on August 27,1991. Formalin has been the replacement antifungal agent, but the present registration restricts its use only to eggs of salmonids and esocids and there are concerns for safety to users and effluents in the environment. Selected candidate antifungal chemicals were tested on cultured fungus for growth inhibition or on infected eggs of rainbow trout to evaluate their antifungal activity.

11934 (DOE/BP/21182–1) **Idaho habitat and natural production monitoring: Part 1: Annual report 1992.** Rich, B.A.; Schrader, W.C.; Petrosky, C.E. Idaho Dept. of Fish and Game, Boise, ID (United States). Fisheries Research Section. Oct 1993. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-91BP21182. Order Number DE94005631. Source: OSTI; NTIS; GPO Dep.

The Idaho Department of Fish and Game (IDFG) has been monitoring and evaluating proposed and existing habitat improvement projects for rainbow-steelhead trout Oncorhynchus mykiss and chinook salmon O. tshawytscha in the Clearwater River and Salmon River drainages for the past 7 years. Projects included in the evaluation are funded by, or proposed for funding by, the Bonneville Power Administration (BPA) under the Northwest Power Planning Act as off-site mitigation for downstream hydropower development

on the Snake and Columbia rivers. This evaluation project is also funded under the same authority (Fish and Wildlife Program, Northwest Power Planning Council [NPPC]). A mitigation record is being developed using increased carrying capacity and/or survival as the best measure of benefit from a habitat enhancement project. Determination of full benefit from a project depends on completion or maturation of the project and presence of adequate numbers of fish to document actual increases in fish production. The depressed status of upriver anadromous stocks has precluded measuring full benefits of any habitat project in Idaho. Partial benefit is credited to the mitigation record in the interim period of run restoration.

11935 (DOE/BP/21182–2) **Idaho habitat and natural production monitoring: Part 2: Annual report 1992.** Kiefer, R.B.; Lockhart, J.N. Idaho Dept. of Fish and Game, Boise, ID (United States). Fisheries Research Section. Oct 1993. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-91BP21182. Order Number DE94007084. Source: OSTI; NTIS; GPO Dep.

The Idaho Department of Fish and Game (IDFG) has been monitoring and evaluating proposed and existing habitat improvement projects for rainbow-steelhead trout Oncorhynchus mykiss and chinook salmon O. tshawytscha in the Clearwater River and Salmon River drainages for the past 7 years. Projects included in the evaluation are funded by, or proposed for funding by, the Bonneville Power Administration (BPA) under the Northwest Power Planning Act as off-site mitigation for downstream hydropower development on the Snake and Columbia rivers. The objectives of this project are: (1) to determine the mathematical relationship between spawning escapement, parr production, and smolt production; (2) estimate carrying capacity and optimal smolt production; and (3) determine habitat factors relating to substrate, riparian, and channel quality that limit natural smolt production.

11936 (DOE/BP/61176–1) **Research plan to determine timing, location, magnitude and cause of mortality for wild and hatchery spring/summer chinook salmon smolts above Lower Granite Dam: Final report.** Lower Granite Migration Study Steering Committee (United States). Oct 1993. 81p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007088. Source: OSTI; NTIS; GPO Dep.

From 1966 to 1968, Raymond estimated an average survival rate of 89% for yearling chinook salmon (Oncorhynchus tshawytscha) migrating from trap sites on the Salmon River to Ice Harbor Dam, which was then the uppermost dam on the Snake River. During the 1970s, the estimated survival rate declined as the proportion of hatchery fish increased and additional dams were constructed. Recent survival indices for yearling chinook salmon smolts in the Snake River Basin indicate that substantial mortalities are occurring en route to Lower Granite Dam, now the uppermost dam on the Snake River. Detection rates for wild and hatchery PIT-tagged smolts at Lower Granite Dam have been much lower than expected. However, for wild fish, there is considerable uncertainty whether overwinter mortality or smolt loss during migration is the primary cause for low survival. Efforts to rebuild these populations will have a better chance of success after the causes of mortality are identified and addressed. Information on the migrational characteristics and survival of wild fish are especially needed. The goal of this initial planning phase is to develop a research plan to outline potential investigations that will determine the timing, location, magnitude, and cause of smolt mortality above Lower Granite Dam.

11937 (DOE/BP–62611-3) **Resident fish planning: Dworshak Reservoir, Lake Roosevelt and Lake Pend Oreille.** Fickeisen, D.H.; Geist, D.R. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 55p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007593. Source: OSTI; NTIS; GPO Dep.

Research projects are presently being conducted to reduce the amount of uncertainty in how reservoir operations within the Columbia River federal power system affect resident fish. Many of these research projects are being conducted to better define operation strategies being proposed under the Columbia River System Operation Review (SOR). This project provides a basis for understanding the potential effects of different operating strategies being considered under the SOR in reservoir fisheries at Lake Roosevelt, Dworshak Reservoir, and Lake Pend Oreille. The methodological framework used here was adapted from the Regional Assessment of Supplementation Project (RASP), a project framework used for evaluating supplementation strategies for anadromous fish. RASP attempts to diagnose the factors that limit production of fishes and outlines a process that can be followed to systematically reduce uncertainty while achieving the objective. In all three reservoirs concerns exist about protecting sensitive species, particularly bull trout and cutthroat trout. In all three reservoirs a need exists for additional baseline information to provide an adequate understanding of the populations of interest.

11938 (DOE/BP/90299–1) **Oregon Trust Agreement Planning Project: Potential mitigations to the impacts on Oregon wildlife resources associated with relevant mainstem Columbia River and Willamette River hydroelectric projects.** Oregon Dept. of Fish and Wildlife, Portland, OR (United States); Fish and Wildlife Service, Portland, OR (United States); Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States); Confederated Tribes of the Warm Springs Reservation of Oregon, OR (United States); Burns Paiute Tribe (United States); Oregon Natural Heritage Program, OR (United States). Oct 1993. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-92BP90299. Order Number DE94007155. Source: OSTI; NTIS; GPO Dep.

A coalition of the Oregon wildlife agencies and tribes (the Oregon Wildlife Mitigation Coalition) have forged a cooperative effort to promote wildlife mitigation from losses to Oregon wildlife resources associated with the four mainstream Columbia River and the eight Willamette River Basin hydroelectric projects. This coalition formed a Joint Advisory Committee, made up of technical representatives from all of the tribes and agencies, to develop this report. The goal was to create a list of potential mitigation opportunities by priority, and to attempt to determine the costs of mitigating the wildlife losses. The information and analysis was completed for all projects in Oregon, but was gathered separately for the Lower Columbia and Willamette Basin projects. The coalition developed a procedure to gather information on potential mitigation projects and opportunities. All tribes, agencies and interested parties were contacted in an attempt to evaluate all proposed or potential mitigation. A database was developed and minimum criteria were established for opportunities to be considered. These criteria included the location of the mitigation site within a defined area, as well as other criteria established by the Northwest Power Planning Council. Costs were established for general habitats within the mitigation area, based on estimates from certified appraisers. An analysis of the cost effectiveness of various types of mitigation projects was completed. Estimates of operation and maintenance costs were also developed. The report outlines strategies for gathering mitigation potentials, evaluating them, determining their costs, and attempting to move towards their implementation.

11939 (DOE/BP/98636–1) **Umatilla River Basin Trap and Haul Program annual report 1993.** Zimmerman, B.C. (Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States). Dept. of Natural Resources); Duke, B.B. Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States). Dept. of Natural Resources; Oregon Dept. of Fish and Wildlife, Corvallis, OR (United States). Nov 1993. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-89BP98636. Order Number DE94006091. Source: OSTI; NTIS; GPO Dep.

Threemile Falls Dam is the major counting and collection point for adult salmonids returning to the Umatilla River. Returning salmon and steelhead were collected at Threemile Dam from October 23, 1992 to July 14, 1993. A total of 1,913 summer steelhead; 239 adult and 64 jack fall chinook; 355 adult and 174 jack coho; and 1,205 adult and 16 jack spring chinook were collected. Fish collected were hauled upstream from Threemile Dam using either a 370 or 3,000 gallon liberation unit. The Westland Canal facility, the major collection point for outmigrating juvenile salmonids and steelhead kelts was in operation from February 15 to July 29, 1993. During that period, fish were trapped 46 days. An estimated 3,228 pounds of fish were transported from the Westland Canal trap to the Umatilla River boat ramp at rivermile 0.5.

11940 (DOE/ID–10360(V2)) **Environmental mitigation at hydroelectric projects: Volume 2, Benefits and costs of fish passage and protection.** Francfort, J.E. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Rinehart, B.N.; Sommers, G.L.; Cada, G.F.; Jones, D.W.; Dauble, D.D.; Hunt, R.T.; Costello, R.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 363p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007505. Source: OSTI; NTIS; GPO Dep.

This study examines envirorunental mitigation practices that provide upstream and downstream fish passage and protection at hydroelectric projects. The study includes a survey of fish passage and protection mitigation practices at 1,825 hydroelectric plants regulated by the Federal Energy Regulatory Commission (FERC) to determine frequencies of occurrence, temporal trends, and regional practices based on FERC regions. The study also describes, in general terms, the fish passage/protection mitigation costs at 50 non-Federal hydroelectric projects. Sixteen case studies are used to examine in detail the benefits and costs of fish passage and protection. The 16 case studies include 15 FERC licensed or exempted hydroelectric projects and one Federally-owned and-operated hydroelectric project. The 16 hydroelectric projects are located in 12 states and range in capacity from 400 kilowatts to 840 megawatts. The fish passage and protection mitigation methods at the case studies include fish ladders and lifts, an Eicher screen, spill flows, airburst-cleaned inclined and cylindrical wedgewire screens, vertical barrier screens, and submerged traveling screens. The costs, benefits, monitoring methods, and operating characteristics of these and other mitigation methods used at the 16 case studies are examined.

14 SOLAR ENERGY

Refer also to citation(s) 12347

1401 Resources and Availability

11941 (NREL/TP–411-6292) **Solar resource: Utility load-matching assessment: Interim subcontract report, 20 September 1991–19 December 1993.** Perez, R. (State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center); Seals, R.; Stewart, R. National Renewable Energy Lab., Golden, CO (United States); State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center. Mar 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000297. Source: OSTI; NTIS; GPO Dep.

This report describes work performed to estimate the load-matching capability of photovoltaics (PV) for a selected group of utilities in the continental United States. The report provides an initial quantitative estimate of this capability for 20 utilities. This characteristic is important because it may indicate that the effective capacity, hence the value, of PV is higher than is traditionally assigned to such non-controllable, non-dispatchable resources. Load-matching capability is determined experimentally by analyzing the interaction between the load requirements of each utility and the output of locally sited PV systems. This type of investigation requires site- and time-specific insolation data that are not commonly available. Here, the needed data were inferred from geostationary satellite remote sensing of the Earth's cloud cover. A secondary objective of this study was to evaluate the suitability of this approach. The results of this investigation are presented in this report.

1403 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11954

11942 (ASCU–87-13, pp. 59-69) **Luz technology: Status and future development.** Charts, Y. (Luz International Ltd., (Israel)). Ben-Gurion Univ. of the Negev, Beersheba (Israel). Applied Solar Calculations Unit. Feb 1987. (CONF-8702183–: 2. Sede Boqer symposium on solar electricity production, Sede Boqer (Israel), 25 Feb 1987). In *Proceedings of the second Sede Boqer symposium on solar electricity production.* 210p. Order Number DE94612413. Source: OSTI; NTIS (US Sales Only): INIS.

Today, Luz is the world's most experienced and successful producer of solar thermal power stations, with 100 Megawatts of solar power already on the power grid of the southern California Edison utility company, and another 480 Megawatts to be added by 1992. Producing a significant percentage of all the solar-generated power throughout the world, Luz has made the solar energy competitive with that of conventional fossil fuels, a welcome development for a world which must face the environmental effects of power production and the prospect of dwindling fossil fuel resources.

1405 Solar Energy Conversion

11943 (DLR-Mitt.–93-04) **The PLVCR 500 and HCPC, tests and results.** Leuchsner, V. Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Stuttgart (Germany). Inst. fuer Bauweisen- und Konstruktionsforschung. 1993. 42p. Order Number DE94752452. Source: OSTI; NTIS (US Sales Only).

The developments of volumetric receivers during the last decade have pointed out the advantages and the wide range of applications in comparison with tube receivers. During three test-periods in 1990 the 500 kW version of the pressure-loaded volumetric ceramic receiver (PLVCR 500) and the hexagonal compound parabolic concentrator (HCPC) of the DLR Stuttgart were mounted on the SSPS tower of the Plataforma Solar de Almeria (Spain). Concerning the size of the experiment, it represents the most extensive R and D work on pressure-loaded volumetric receivers until now. The receiver and the secondary concentrator were tested together and seperately. A gauge pressure of 4.2 bars at air outlet temperatures of 960 C has been reached. The secondary concentrator has been tested under various flux conditions, the inlet and outlet flux-distributions were measured. With this test the feasibility of a modular design of receiver and secondary concentrator could be shown. (orig.). 31 figs., 1 tab., 6 refs.

11944 (DOE/CH/10093–264) **Photovoltaics: Program overview fiscal year 1993.** National Renewable Energy Lab., Golden, CO (United States). Feb 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000246. Source: OSTI; NTIS; GPO Dep.

This overview is divided into sections titled: 1993 PV program accomplishments, PV systems for today's markets generate power and experience, systems development and testing prepares products for market, advances in manufacturing hasten availability of innovations, cooperative research improves PV technology, additional achievements in cooperative R&D, and summary of PV program services. Figs, tabs.

11945 (NREL/TP–411-5815) **Silicon-film™ photovoltaic manufacturing technology: Annual subcontract report, 15 January 1992–15 November 1992.** Bottenberg, W.R. (AstroPower, Inc., Newark, DE (United States)); Hall, R.B.; Jackson, E.L.; Lampo, S.; Mulligan, W.P.; Barnett, A.M. National Renewable Energy Lab., Golden, CO (United States); AstroPower, Inc., Newark, DE (United States). Feb 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000202. Source: OSTI; NTIS; GPO Dep.

This report describes work under a subcontract to upgrade AstroPower, Inc.'s facility to produce 1.22-m^2 Silicon-Film™ PV modules with an output of 170 W_p. The focus for the first year of the PVMaT Phase 2A project is to establish the baseline process capability and optimize the performance of the present machine. This first year's activities accelerated the advance of Silicon-Film™ manufacturing technology in several ways. First, the project led directly to plans to make an early introduction of a large solar cell product. The successful fabrication of 646-cm^2 wafers and solar cells paved the way for dramatically increasing the power output per solar cell. Second was the establishment of a basis for the design and construction of a 2.4-MW/yr wafer machine. Another important contribution was the determination of the importance of H^+ implantation processes for polycrystalline silicon technologies.

11946 (NREL/TP–411-6263) **Amorphous silicon photovoltaic maufacturing technology, Phase 2A: Annual subcontract report, 1 May 1992–30 April 1993.** Duran, G. (Utility Power Group, Chatsworth, CA (United States)); Mackamul, K.; Metcalf, D.; Koniares, A.; Skinner, D.; Volltrauer, H. National Renewable Energy Lab., Golden, CO (United States); Utility Power Group, Chatsworth, CA (United States); Advanced Photovoltaic Systems, Inc., Princeton, NJ (United States). Feb 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000294. Source: OSTI; NTIS; GPO Dep.

This report describes teamed research by Utility Power Group (UPG) and Advanced Photovoltaic Systems, Inc., (APS) to advance photovoltaic (PV) manufacturing technologies, reduce module production costs, increase average module performance, and increase the existing production capacity. UPG and APS conducted parallel efforts to develop their manufacturing lines. Areas of focus included encapsulation and termination, product design, process and quality control, and automation. UPG improved the existing encapsulation system by developing advanced encapsulation materials and processes, resulting in a module that does not require backing glass. UPG also developed advanced termination materials and processes. APS performed development activities centered on the EUREKA manufacturing line. Developments in the APS EUREKA encapsulation system were in addition to the UPG activity on encapsulation, and they offer an alternative approach to the problems of encapsulating large-area, thin-film modules.

11947 (NREL/TP–411-6264) **Automated solar cell assembly teamed process research: Semiannual subcontract report, 7 January 1993–30 June 1993.** Nowlan, M.J. (Spire Corp., Bedford, MA (United States)); Hogan, S.J.; Darkazalli, G.; Breen, W.F.; Murach, J.M.; Sutherland, S.F. National Renewable Energy Lab., Golden, CO (United States); Spire Corp., Bedford, MA (United States). Feb 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000295. Source: OSTI; NTIS; GPO Dep.

This report describes work done under Phase 3A of the PVMaT project to address problems that are generic to the photovoltaics (PV) industry. Crystalline silicon solar cells were used in the majority of all terrestrial power modules shipped in 1992. Spire's analysis in Phase 1 of the PVMaT project indicated that the use of thin ($\leq$200-μm) silicon cells can substantially reduce module manufacturing costs, provided that processing yields remain as high as they are now for processing standard thickness cells. Because present solar cell tabbing and interconnecting processes have unacceptably high yield losses with such thin cells, the objective of this Phase 3A subcontract is to use Spire's light soldering technology and experience in designing and fabricating solar cell tabbing and interconnecting equipment to develop high yield throughput, fully automated processes for tabbing and interconnecting thin cells.

11948 (NREL/TP–411-6396) **Research on stable, high-efficiency amorphous silicon multijunction modules: Semiannual subcontract report, 1 March 1993–30 November 1993.** Guha, S. (United Solar Systems Corp., Troy, MI (United States)). National Renewable Energy Lab., Golden, CO (United States); United Solar Systems Corp., Troy, MI (United States). Mar 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000298. Source: OSTI; NTIS; GPO Dep.

This report describes the progress made during the first half of Phase III of the R&D program to obtain high-efficiency amorphous silicon alloy multijunction modules. The highlight of the work includes (1) demonstration of the world's highest initial module efficiency (area of 0.09 m^2) of 11.4% as confirmed by NREL, and (2) demonstration of stable module efficiency of 9.5% after 1-sun light soaking for 1000 h at 50°C. In addition, fundamental studies were carried out to improve material properties of the component cells of the multijunction structure and to understand the optical losses associated with the back reflector.

11949 (NREL/TP–451-6135) **In-situ characterization of growth and interfaces in a-Si:H devices: Annual subcontract report, 1 May 1992–30 April 1993.** Collins, R.W. (Pennsylvania State Univ., University Park, PA (United States)); Wronski, C.R.; An, I.; Lu, Y.; Nguyen, H.V. National Renewable Energy Lab., Golden, CO (United States); Pennsylvania State Univ., University Park, PA (United States). Feb 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000291. Source: OSTI; NTIS; GPO Dep.

This report describes work to reach two goals–an individual goal and a wide-gap team goal. The individual goal was to investigate the "top junction" for defects using the spectroscopic ellipsometry technique. This will include an evaluation if specific defects are associated with C, B, Sn (diffusing from the transparent conducting oxide [TCO]) or Na (diffusing from the glass). It may include an assessment of the function of a graded a-SiC:H buffer layer. As defects are identified and characterized, their influence on the transport properties will be assessed. This should lead to better parameters used as input to models for the electronic materials and device performance. The goal of the wide-gap team was to demonstrate, characterize, and understand improved doped and undoped "wide gap" materials for use in achieving 15%-efficient stabilized photovoltaic modules ("wide gap" materials are defined by this team to have a band gap $\geq$ 1.9 eV). The major conclusions of the research are discussed in the report.

11950 (NREL/TP–451-6192) **Research on the stability, electronic properties, and structure of a-Si:H and its alloys: Annual subcontract report, 1 June 1992–31 May 1993.** Jackson, W.B. (Xerox Palo Alto Research Center, CA (United States)); Johnson, N.; Nickel, N. National Renewable Energy Lab., Golden, CO (United States); Xerox Palo Alto Research Center, CA (United States). Feb 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000292. Source: OSTI; NTIS; GPO Dep.

This report describes work focusing on the defect and transport properties of a-Si:H with particular emphasis on defect metastability. Light-induced defects remain the major impediment to higher stabilized solar cell efficiencies. The many years of research have shown that this is a difficult problem to solve, and we take the view that a solution can be found only with a deep understanding of the mechanism; this has been our main goal. The metastability is closely related to the intrinsic defect properties, so these studies have also led to a greatly improved model of all the electronic properties of a-Si:H. Section A of the report discusses a theoretical analysis of the defect pool model for the equilibrium dark defect density, with particular reference to whether there are significant charged defects. Section B discusses the use of an electronic transport model to analyze forward and reverse currents and extends it to the calculation of field dependences of bulk and contact currents, which give more precision to the analysis of defects from reverse bias thermal generation currents. Electronic transport is discussed in Section C. Work done on H transport and bonding is described in Section D.

11951 (NREL/TP–451-6215) **Role of polycrystallinity in CdTe and $CuInSe_2$ photovoltaic cells: Annual subcontract report, 1 April 1992–31 March 1993.** Sites, J.R. National Renewable Energy Lab., Golden, CO (United States); Colorado State Univ., Fort Collins, CO (United States). Feb 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94000293. Source: OSTI; NTIS; GPO Dep.

This report describes work to conduct several investigations of thin-film polycrystalline solar cells. (1) An analysis of high-efficiency solar cells fabricated at the University of South Florida showed significant reduction in forward recombination current, and the cells were stable over a 3-month test period. (2) Transient voltage effects were documented in a large number of polycrystalline cells and were attributed to long-lived trapping states sensitive to voltage changes near one-half open-circuit voltage. (3) Collection efficiency and its voltage dependence were carefully calculated. The typical effect on photocurrent at operating voltages is about 2% for $CuInSe_2$, and less for other cells.

1406 Photovoltaic Power Systems

Refer also to citation(s) 11941, 12285

1407 Solar Thermal Power Systems

11952 (SAND–93-7026) **A compendium of solar dish/Stirling technology.** Stine, W.B. (California State Polytechnic Univ., Pomona, CA (United States). Dept. of Mechanical Engineering); Diver, R.B. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007752. Source: OSTI; NTIS; GPO Dep.

This report surveys the emerging dish/Stirling technology. It documents – using consistent terminology the design characteristics of dish concentrators, receivers, and Stirling engines applicable to solar electric power generation. Development status and operating experience for each system and an overview of dish/Stirling technology are also presented. This report enables comparisons of concentrator, receiver, and engine technologies. Specifications and performance data are presented on systems and on components that are in use or that could be used in dish/Stirling systems. This report is organized into two parts: The first part (Chapters 1 through 4) provides an overview of dish/Stirling technology – the dish/Stirling components (concentrator, receiver, and engine/alternator), current technology, basic theory, and technology development. The second part (Chapters 5 through 7) provides a detailed survey of the existing dish/Stirling concentrators, receivers, and engine/alternators.

1409 Solar Thermal Utilization

Refer also to citation(s) 11507, 12442

11953 (DOE/FTR–94003575) **Travel to Italy to attend the ninth Experts Meeting of IEA Solar R&D Task 13: "Advanced Solar Low-Energy Buildings": Foreign trip report, November 8–11, 1993.** Balcomb, J.D. National Renewable Energy Lab., Golden, CO (United States). 27 Nov 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94003575. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Progress on Task 13 (Advanced Solar Low-Energy Buildings) is good and there are few problems. Attendance at the IEA meeting was 29 persons representing all of the countries participating in Task 13. NREL attended for the United States. Three new plans for houses were presented and discussed. Two technology presentations were made of which a Japanese concept for a solar-assisted heat pump bears further investigation by the United States. The major topic discussed was the final report of Task 13. NREL is quite involved in that effort. The task has been extended by two years.

11954 (SAND–93-1959) **Applications of solar reforming technology.** Spiewak, I. (Weizmann Inst. of Science, Rehovoth (Israel)); Tyner, C.E.; Langnickel, U. Sandia National Labs., Albuquerque, NM (United States). Nov 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007842. Source: OSTI; NTIS; GPO Dep.

Research in recent years has demonstrated the efficient use of solar thermal energy for driving endothermic chemical reforming reactions in which hydrocarbons are reacted to form synthesis gas (syngas). Closed-loop reforming/methanation systems can be used for storage and transport of process heat and for short-term storage for peaking power generation. Open-loop systems can be used for direct fuel production; for production of syngas feedstock for further processing to specialty chemicals and plastics and bulk ammonia, hydrogen, and liquid fuels; and directly for industrial processes such as iron ore reduction. In addition, reforming of organic chemical wastes and hazardous materials can be accomplished using the high-efficiency destruction capabilities of steam reforming. To help identify the most promising areas for future development of this technology, we discuss in this paper the economics and market potential of these applications.

1420 Heat Storage

Refer also to citation(s) 11953

1440 Legislation and Regulations

Refer also to citation(s) 12346

15 GEOTHERMAL ENERGY

11955 (DOE/ID/13040–22) **Geothermal direct-heat utilization assistance: Quarterly report, July–September 1993.** Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center. [1993]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-90ID13040. Order Number DE94003290. Source: OSTI; NTIS; GPO Dep.

This report details activities from July through September 1993, Topics addressed are: Technical Assistance; Research and Development Activities; Technology Transfer; Geothermal Progress Monitor; and Personnel.

1501 Resources and Availability

Refer also to citation(s) 12329

1502 Geology and Hydrology of Geothermal Systems

Refer also to citation(s) 11536

11956 (UCRL-JC–114798) **Testing geochemical modeling codes using New Zealand hydrothermal systems.** Bruton, C.J.; Glassley, W.E.; Bourcier, W.L. Lawrence Livermore National Lab., CA (United States). Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309228–9: Focus 93: site characterization and model validation, Las Vegas, NV (United States), 26-29 Sep 1993). Order Number DE94006667. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrothermal systems in the Taupo Volcanic Zone, North Island, New Zealand are being used as field-based modeling exercises for the EQ3/6 geochemical modeling code package. Comparisons of the observed state and evolution of selected portions of the hydrothermal systems with predictions of fluid-solid equilibria made using geochemical modeling codes will: (1) ensure that we are providing adequately for all significant processes occurring in natural systems; (2) determine the adequacy of the mathematical descriptions of the processes; (3) check the adequacy and completeness of thermodynamic data as a function of temperature for solids, aqueous species and gases; and (4) determine the sensitivity of model results to the manner in which the problem is conceptualized by the user and then translated into constraints in the code input. Preliminary predictions of mineral assemblages in equilibrium with fluids sampled from wells in the Wairakei geothermal field suggest that affinity-temperature diagrams must be used in conjunction with EQ6 to minimize the effect of uncertainties in thermodynamic and kinetic data on code predictions. The kinetics of silica precipitation in EQ6 will be tested using field data from silica-lined drain channels carrying hot water away from the Wairakei borefield.

1503 Geothermal Exploration and Exploration Technology

Refer also to citation(s) 11959

11957 (DOE/ID/12934–18) **Transient adsorption experiment: Salinity and noncondensible gas effects: Quarterly report, July–September 1993.** Stanford Univ., CA (United States). Stanford Geothermal Program. 20 Sep 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-90ID12934. Order Number DE94003570. Source: OSTI; NTIS; GPO Dep.

The purpose of this project is to analyze the adsorption and desorption of steam in geothermal reservoirs, considering the effects of dissolved salts and of noncondensible gases. This report details activities during the gases. This report details activities during the reporting period of July through September 1993.

11958 (EUR–13647, pp. 5-15) **Development of light hydrocarbon gas lithogeochemistry and its response to different styles of mineralization.** Cazalet, P.C.D. (Mercury Hydrocarbons Ltd., Limerick (Ireland)); Disnar, J.R. Commission of the European Communities, Luxembourg (Luxembourg). 1992. In *Summary reports of the R and D programme: primary raw materials (1986-89). Volume 1.* 287p. Order Number DE94749206. Source: OSTI; NTIS (US Sales Only).

The discovery of anomalously high amounts of methane in rocks adjacent to mineralization led to the examination of a new lithogeochemical exploration tool for hidden base metal deposits. The method, based on the chromatographic analysis of the volatile organic compounds released by heating the rocks in sealed tubes (210 C; 2 h 30) was first tested on the site of the initial findings and later on deposits in Ireland and in Europe. Methane and/or other organic compounds were detected in the vicinity of mineralization but some questions were left unsolved, the main problems being: the significance of results from the heat extraction procedure, questioned by the production, together with alkanes, of high amounts of compounds not usually observed in rocks (alkenes, oxygen-containing compounds); the difficulty of obtaining precise results compared to other lithogeochemical methods such as trace metal analysis; the relationship between hydrocarbon gases, trace metals and ore genesis.

1505 Economic, Industrial, and Business Aspects

11959 (SAND–92-1728) **A study of geothermal drilling and the production of electricity from geothermal energy.** Pierce, K.G. (Sandia National Labs., Albuquerque, NM (United States)); Livesay, B.J. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007839. Source: OSTI; NTIS; GPO Dep.

This report gives the results of a study of the production of electricity from geothermal energy with particular emphasis on the drilling of geothermal wells. A brief history of the industry, including the influence of the Public Utilities Regulatory Policies Act, is given. Demand and supply of electricity in the United States are touched briefly. The results of a number of recent analytical studies of the cost of producing electricity are discussed, as are comparisons of recent power purchase agreements in the state of Nevada. Both the costs of producing electricity from geothermal energy and the costs of drilling geothermal wells are analyzed. The major factors resulting in increased cost of geothermal drilling, when compared to oil and gas drilling, are discussed. A summary of a series of interviews with individuals representing many aspects of the production of electricity from geothermal energy is given in the appendices. Finally, the implications of these studies are given, conclusions are presented, and program recommendations are made.

1507 Products and By-Products

11960 (DOE/SF/15798–T5) **Community Geothermal Technology Program: Hawaii glass project: Final report.** Miller, N. (comp.); Irwin, B. Hawaii Univ., Honolulu, HI (United States). 20 Jan 1988. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007005. Source: OSTI; NTIS; GPO Dep.

Objective was to develop a glass utilizing the silica waste material from geothermal energy production, and to supply local artists with this glass to make artistic objects. A glass composed of 93% indigenous Hawaiian materials was developed; 24 artists made 110 objects from this glass. A market was found for art objects made from this material.

11961 (DOE/SF/15798–T8) **Community Geothermal Technology Program: Silica bronze project: Final report.** Bianchini, H. Hawaii Univ., Honolulu, HI (United States). Oct 1989. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007008. Source: OSTI; NTIS; GPO Dep.

Objective was to incorporate waste silica from the HGP-A geothermal well in Pohoiki with other refractory materials for investment casting of bronze sculpture. The best composition for casting is about 50% silica, 25% red cinders, and 25% brick dust; remaining ingredient is a binder, such as plaster and water.

11962 (DOE/SF/15798–T11) **Community Geothermal Technology Program: Electrodeposition of minerals in geothermal brine.** Oceanit Labs., Inc., Honolulu, HI (United States). 1990. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007011. Source: OSTI; NTIS; GPO Dep.

Objective was to study the materials electrodeposited from geothermal brine, from the HGP-A well in Puna, Hawaii. Due to limitations, only one good set of electrodeposited material was obtained; crystallography indicates that vaterite forms first, followed by calcite and then perhaps aragonite as current density is increased. While the cost to weight ratio is reasonable, the deposition rate is very slow. More research is needed, such as reducing the brittleness. The electrodeposited material possibly could be used as building blocks, tables, benches, etc. 49 figs, 4 tabs, 7 refs.

1508 Geothermal Power Plants

11963 (LA-UR–94-577) **Hot Dry Rock geothermal energy moving towards practical applications.** Duchane, D. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404107–3: New Mexico conference on the environment, Albuquerque, NM (United States), 24-26 Apr 1994). Order Number DE94007574. Source: OSTI; NTIS; GPO Dep.

The thermal energy present in hot rock at depth is a vast resource which has so far been tapped only in those unusual locations where natural fluids exist to transport that energy to the surface. For the past twenty years work has been underway at the Los Alamos National Laboratory to develop the technology to access and recovery the heat present in rock which is hot but contains no natural mobile fluid. The world's first plant capable of sustained production of geothermal energy from HDR was completed in 1991. This facility combined an artificial geothermal reservoir of sufficient size and high enough temperature to deliver large amounts of useful energy with a surface plant built to power industry standards and capable of sustained, routine operation. During the past two years, extended testing at Fenton Hill has demonstrated that energy can be extracted from HDR on a continuous basis. Thermal energy was produced continuously at a rate of about 4 MW in two test phases lasting 112 and 55 days, respectively, and intermittently for a period of 7 1/2 months between the continuous test segments. Temperature measurements at the surface and at depth indicated no decline in the average discharge temperature of water from the reservoir over the span of the test. In fact, tracer testing indicated that access of the circulating water to the hot reservoir rock improved as the test proceeded.

1509 Geothermal Engineering

Refer also to citation(s) 11553, 11587, 11959, 11963

1510 Direct Energy Utilization

11964 (DOE/SF/15798–T6) **Community Geothermal Technology Program: Fruit drying with geothermal energy: Final report.** Papaya Products of Hawaii, Keaau, HI (United States). 14 Mar 1988. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007006. Source: OSTI; NTIS; GPO Dep.

Largest problem was lack of proper recording and controlling instrumentation. Agricultural products tested were green papaya powder, banana slices, and pineapple slices. Results show that a temperature of 120 F is a good drying temperature. Papaya should be mature green and not overly ripe; banana ripeness is also important; and pineapple slice thickness should be very uniform for even drying. Geothermal drying is feasible. Figs, tabs.

11965 (DOE/SF/15798–T7) **Community Geothermal Technology Program: Cloth dyeing by geothermal steam: An experiment in technology transfer from Japan to Hawaii, Final report.** Furumoto, A.S. Hawaii Univ., Honolulu, HI (United States). 31 Dec 1987. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007007. Source: OSTI; NTIS; GPO Dep.

This was an experiment to test whether cloth dyeing using geothermal steam (already proven in Japan) would be feasible in Hawaii. Results: Using a fabricated steam vat, cotton, silk, and synthetic can be dyed; the resulting material received high grades for steadfastness and permanency under dye testing. Techniques that were successful in Matsukawa, were replicated in Puna. However, attempts to embed leaf patterns on cloth using natural leaves and to extract natural dyes from Hawaiian plants were unsuccessful; the color of natural dyes deteriorated in hours. But chemical dyes gave brilliant hues or shades, in contrast to those in Japan where the steam there gave subdued tones. It is concluded that geothermal dyeing can be a viable cottage industry in Puna, Hawaii.

11966 (DOE/SF/15798–T9) **Community Geothermal Technology Program: Experimental lumber drying kiln: Final report.** Leaman, D.; Irwin, B. Hawaii Univ., Honolulu, HI (United States). Oct 1989. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007009. Source: OSTI; NTIS; GPO Dep.

Goals were to demonstrate feasibility of using the geothermal waste effluent from the HGP-A well as a heat source for a kiln operation to dry hardwoods, develop drying schedules, and develop automatic systems to monitor/control the geothermally heated lumber dry kiln systems. The feasibility was demonstrated. Lumber was dried in periods of 2 to 6 weeks in the kiln, compared to 18 months air drying and 6–8 weeks using a dehumidified chamber. Larger, plate-type heat exchangers between the primary fluid and water circulation systems may enable the kiln to reach the planned temperatures (180–185 F). However, the King Koa partnership cannot any longer pursue the concept of geothermal lumber kilns.

11967 (DOE/SF/15798–T10) **Community Geothermal Technology Program: Bottom heating system using geothermal power for propagation: Final report, Phases 1 and 2.** Downing, J.C. Leilani Foliage, Pahoa, HI (United States). Jan 1990. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007010. Source: OSTI; NTIS; GPO Dep.

The objective is to develop and study a bottom-heating system in a greenhouse utilizing geothermal energy to aid germination and speed growth of palms. Source of heat was geothermal brine from HGP-A well. The project was successful; the heat made a dramatic difference with certain varieties, such as Areca catechu (betelnut) with 82% germination with heat, zero without. For other varieties, germination rates were much closer. Quality of seed is important. Tabs, figs.

11968 (DOE/SF/15798–T12) **Community Geothermal Technology Program: Media steam pasteurization using geothermal fluid at NELHA, Nol'i O Puna laboratory: Final report.** D'Anna B'Nana, Pahoa, HI (United States). Oct 1990. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85SF15798. Order Number DE94007012. Source: OSTI; NTIS; GPO Dep.

The project was successful in confirming the suitability of shredded coconut husks in potting mix and the acceptability of untreated geothermal steam to pasteurize the mix. The pots were exposed to the steam; the average media temperature was maintained at 160 F for 30 min. The pH levels, which were slightly elevated in virgin media, rose only slightly (< 0.5) after steaming. Salt levels doubled (still safe). Mg solubility increased but not to toxic levels. Test plantings showed no significant differences after 8 months, indicating that coconut fiber can be pasteurized and used to replace imported peat moss. 6 refs, 4 tabs.

17 WIND ENERGY

Refer also to citation(s) 12347

1701 Resources and Availability (Climatology)

Refer also to citation(s) 12329

1704 Economic, Industrial, and Business Aspects

Refer also to citation(s) 11979

1705 Environmental Aspects

11969 (ETSU-N–123, [pp. 10]) **Applications of aero-acoustic analysis to wind turbine noise control.** Lowson, M. (Flow Solutions Ltd., Bristol (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Wind turbine noise generation mechanisms are essentially equivalent to the aero-acoustic mechanisms of other rotors, which have been studied in depth for many years. Basic sources for the wind turbine noise radiation process are defined, and their significance assessed. From the analysis, areas of potential improvement in wind turbine noise prediction are defined. Suggestions are made for approaches to wind turbine noise control which separate the noise problems at cut-in from those at rated power. Some of these offer the possibility of noise reduction without unfavourable effects on performance. (author).

11970 (ETSU-N–123, [pp. 10]) **Analysis of noise emission from the Bonus Kombi wind turbine.** Dunbabin, P. (Edinburgh Univ. (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Part of the problem in comparing noise emission levels from wind turbines with theory is that it is difficult to know exactly which mechanism is responsible for noise in each part of the spectrum. The majority of noise measurements are made at ground level, some distance away from the machine, and generally the results are expressed as average values over many cycles of the turbine. The aim of these experiments was to address this problem, and to develop a technique for investigating each noise mechanism separately. A microphone was placed behind a rotating blade, and the output voltage sampled rapidly. We would expect to detect leading edge noise before detecting trailing edge noise, and therefore it should be possible to separate these two noise sources. More importantly, the very low frequency microphone trace can provide information about the aerodynamic conditions on the blade. A calculation to see if it is possible to deduce the bound circulation on the blade directly from the low frequency pressure fluctuation detected by the microphone is described. An accurate description of the decrease in bound circulation near the tip could be a useful input to a tip noise theory, especially if comparisons were made for tips of different shapes. The analysis technique also allows the separation of mechanical discrete frequency noise from aerodynamic broad band noise, and in the final section, the question of whether mechanical noise is radiated by the blades is addressed. (author).

11971 (ETSU-N–123, [pp. 10]) **Mechanical noise from wind turbines.** Pinder, N. (Southampton Univ. (United Kingdom). ISVR (Inst. of Sound and Vibration Research) Consultancy Service). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Community annoyance due to noise from wind turbines is often the result of noise character rather than level. Although the overall

contributions from each of the two main classes of noise source, namely aerodynamic and mechanical, are often of a similar order for an untreated turbine, it is usually the mechanical sources which provide the dominant noise characteristics that may lead to annoyance. In this paper, the sources of mechanical noise are identified primarily with reference to horizontal axis wind turbines and then attention is concentrated on the rotor-shaft step-up gearbox, which is normally the top-ranking source. The major gearbox noise mechanisms and transmission paths are discussed and reference made to Noise Specifications and procedures applicable to the gearbox prior to its installation. The reduction of machinery noise is reviewed both at source and by treatment of transmission paths. (author).

11972 (ETSU-N–123, [pp. 10]) **Sound power measurement and certification.** MacKinnon, A. (National Engineering Lab., East Kilbride (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

It is anticipated that there will be a substantial growth in the exploitation of renewable energy from the wind over the next few years. A major factor in this expected growth is the environmental acceptance or otherwise of wind turbines and in particular their noise characteristics. It is generally accepted within the turbine community that reliable methods of measuring and quantifying a turbine's acoustic signature are essential if this exploitation is to be realised. This paper will seek to review current practice both in the UK and further afield and will describe the development of a practical and reliable test method, which will aid the Wind Turbine Manufacturer, Developer and Planner. (author).

11973 (ETSU-N–123, [pp. 10]) **Noise from wind turbines: State of the art in Denmark.** Andersen, B. (Dk-Teknik, Soeborg (Denmark)); Larsen, P. AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Denmark has 3200 wind turbines with an installed maximum capacity of 418MW. The most important Danish research projects into wind turbine noise and the main results are listed. These date from 1983. Two comprehensive studies are currently in progress. The first is an analytical and empirical investigation of aerodynamic noise from wind turbine rotors and has so far dealt mainly with tip noise. The measurement method, using a hard board mounted microphone on the ground near the turbine, is described. Four different tip designs have been tested. Some examples of reference sound power level spectra for three of the designs are presented. During the past two years a computerbased data acquisition system has been used for real-time determination of sound power levels. The second study, which has just commenced, is on annoyance from wind turbine noise. It will include noise measurements, masking calculations and a social survey on the perceived nuisance. (UK).

11974 (ETSU-N–123, [pp. 10]) **Legal and planning framework for the control of noise emissions.** Trinick, M. (Bond Pearce, Solicitors, Plymouth (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

An examination of the statutory basis for the control of noise emissions is presented. Principal pieces of United Kingdom legislation and some advisory notes have been produced within 6 extensive appendices. The paper briefly examines the controls in other EC countries before discussing the way in which planning controls in the United Kingdom relate to the jurisdiction of the court. (author).

11975 (ETSU-N–123, [pp. 10]) **The environmental health officer's role in the determination of wind turbine applications.** Spode, D. (North Cornwall District Council (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

An account is given from the Local Authority Environmental Health view point about the application for Deli Wind Farm, Delabole, Cornwall, UK, which was the first such application we received and was approved and is now operational. Subsequently we have approved the application for Cold Northcott, have refused two other applications and a further two are being processed. The account will indicate the practical problems faced by Environment Health Officers in assessing applications and advising the decision makers. An indication of the information which the author considers it is essential to have included in the noise section of an environmental assessment is given and suggestions are made on the type of conditions which should be attached to any planning consent with a view to protecting occupiers of the closest dwelling, this being particularly important where the relevant separation distances give little room for error in getting the decision right. (author).

11976 (ETSU-N–123, [pp. 10]) **Noise assessment at Carland Cross wind farm site.** Bass, J. (Renewable Energy Systems Ltd., Hemel Hempstead (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

A propagation model is necessary to predict noise levels resulting from a wind farm at nearby dwellings. These levels depend upon the site's topography and the local meteorology. The most commonly used model is that proposed by the IEA, which considers solely hemispherical spreading and air absorption. Several more detailed models exist, for example ENM (Environmental Noise Model), a proprietary software package specifically designed for the prediction of noise levels resulting from multiple noise sources in a complex environment, and CONCAWE, a model developed by the Oil Companies Study Group for the Conservation of Clean Air and Water. To assess the performance of these models a loudspeaker has been used to broadcast noise across the Carland Cross site in the UK and noise level measurements made at a number of locations. These data have been compared with predictions obtained from the IEA, ENM and CONCAWE models. Wind farm noise may have an audible tonal content in the near field. By broadcasting noise with a tonal content similar to a Windane 34 and measuring narrow band noise spectra at increasing distances from the source the audibility of the tones have been assessed using critical bandwidth analysis. The results suggest that such tones will not be audible in the far field. A brief discussion about the mechanism by which this happens is also included. (author).

11977 (ETSU-N–123, [pp. 10]) **Annoyance rating of wind turbine noise.** Iredale, R. AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

Annoyance rating is important, but more important still is agreement on techniques for formulating minimal complaint criteria for design and specification purposes thus integrating noise control into the plant at the outset. A minimal complaint design criteria is suggested that finds its origin in the logic and techniques used successfully over many years for a wide range of power plant and

other installations. The criterion is based on the masking of the wind turbine noise by the wind generated background noise. Satisfactory use of the criterion depends on the specification of inaudibility for the tones generated by the mechanical plant. Wind turbines generate more drive train noise than is realized and this contains many tones which tend to characterize the noise. Reduction of drive train noise would not only reduce the overall noise level but also give it a more acceptable character providing a margin against complaint in unusual circumstances of propagation. This requires very careful design of noise and vibration control in individual components. Vibration isolation between the support structures and the nacelle also requires careful attention. (UK).

11978 (ETSU-N–123, [pp. 10]) **Noise impact assessment of wind farms.** Hayes, M. (Hayes-McKenzie Partnership, Southampton (United Kingdom)). AEA Environment and Energy, Harwell (United Kingdom). Aug 1993. (CONF-9206403–: Wind turbine noise workshop, Harwell (United Kingdom), 30 Jun 1992). In *Proceedings of a workshop on wind turbine noise.* 241p. Order Number DE94617953. Source: OSTI; NTIS (US Sales Only); INIS.

Each paper is followed by a record of the subsequent discussion.

The noise impact assessment of a wind farm is dependent upon a number of factors pertinent to the site. The most controversial is the selection of a criterion which is acceptable to both the developer of a site, in terms of maximising the number of turbines he may operate without fear of injunction to stop, and the local residents and Environmental Health Officer who will have to enforce any agreements. A number of British Standards exist which cover noise issues. There are, however, certain reservations about their use when applied to potential wind farm developments; some of the more relevant standards are outlined. In addition, Draft Planning Guidance notes which have recently been issued are discussed. These are intended to provide an indication to local planning authorities as to what noise levels and criteria may be acceptable when considering noise emitted by wind farms. No European standard for noise emission from wind farms exists but the legislative position in Denmark, the Netherlands, Germany and Sweden is briefly considered. It is considered that when a maximum level criterion is set it should take into account the existing background noise levels based on measurements which are taken at the most sensitive dwellings to the site. A method for calculating emitted noise levels from turbine arrays is described. (UK).

1706 Wind Energy Engineering

11979 (DOE/BP/99893–T1) **Variable-speed wind system design: Final report.** Lauw, H.K.; Weigand, C.H.; Marckx, D.A. Electronic Power Conditioning, Inc., Corvallis, OR (United States). Oct 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-93BP99893. Order Number DE94006210. Source: OSTI; NTIS; GPO Dep.

Almost from the onset of the development of wind energy conversion systems (WECS), it was known that variable-speed operation of the turbine would maximize energy capture. This study was commissioned to assess the cost, efficiency gain, reduction of the cost of energy (COE), and other operating implications of converting the existing hardware of a modern fixed-speed wind energy conversion system to variable-speed operation. The purpose of this study was to develop a preliminary design for the hardware required to allow variable-speed operation using a doubly-fed generator with an existing fixed-speed wind turbine design. The turbine selected for this study is the AWT-26 designed and built by Advanced Wind Turbines Inc. of Redmond, Washington. The lowest projected COE using this variable-speed generation system is projected to be $0.0499/kWh, compared to the lowest possible COE with fixed-speed generation which is projected to be $0.0546/kWh. This translates into a 8.6% reduction of the COE using this variable-speed generation option. The preliminary system design has advanced to where the printed circuit boards can be physically laid out based on the schematics and the system software can be written based on the control flow-charts. The core of hardware and software has been proven to be successful in earlier versions of VSG systems. The body of this report presents the results of the VSWG system development. Operation under normal and fault conditions is described in detail, the system performance for variable-speed operation is estimated and compared to the original fixed-speed system performance, and specifications for all system components (generator, power electronic converter, and system controller) are given. Costs for all components are estimated, and incremental system cost is compared to incremental energy production. Finally, operational features of the VSWG which are not available in the existing FSWG system are outlined.

11980 (DOE/FTR–94004468) **Travel to Denmark to attend the Aerodynamics Specialist Meeting for members of IEA R&D Wind, Annex XI: Foreign trip report, 27 November 1993–2 December 1993.** Tangler, J.; Hansen, C. National Renewable Energy Lab., Golden, CO (United States). 22 Dec 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94004468. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The two day, 7th IEA Symposium on Aerodynamics of wind turbines was attended by 25 individuals representing 16 organizations from Denmark, Finland, Germany, Netherlands, Sweden, United Kingdom, and the United States. Subjects of discussion included airfoil design using XFOIL and the Eppler code, 2D and 3D airfoil testing, airfoil post-stall performance prediction, airfoil roughness due to insect and ice accumulation, aerodynamic noise related to blade trailing edge thickness and tip shape, turbulence induced loads as predicted by the 3-velocity component MANN model, performance prediction using free-wake and Navier Stokes methods, and the ADAMS load prediction method. On the one day trip to RISO we meet with Flemming Rasmussen, Helge Madsen, and Troels Pedersen. Several activities were reviewed during our tour of test site. Their top priority appeared to be loads testing of the LM 19 meter blade on a Bonus 500 kW turbine complimented by fatigue testing on their test stand. The four new stall regulated 500 kW turbines (Bonus, Micon, Nortank, and WindWorld) will use this blade. Ongoing research activities included testing of a solid wood prototype 6.3 meter blade set to evaluate new airfoils and blade planform shape, tests of various tip geometries for noise reduction, prototype evaluation of a small-scale two-bladed pitching nacelle concept (a la Carter senior). Several recent Riso reports on loads and dynamics of stall regulated and teetering rotors were acquired during our visit.

20 FOSSIL-FUELED POWER PLANTS

2001 Power Plants and Power Generation

Refer also to citation(s) 11407, 11409, 11410, 11421, 11513, 11515, 11517, 11518, 11520, 11910, 12043, 12044, 12051, 12053, 12097

11981 (CONF-9309152–Vol.1, pp. 301-316) **American electric power presssurized fluidized bed combustion technology status.** Marrocco, M.M. (American Electric Power, Service Corp., Columbus, OH (United States)). Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The American Electric Power Pressurized Fluidized Bed Combustion (PFBC) Program is the only ongoing PFBC and Hot Gas Clean Up (HGCU) Program in the United States. The 70 MWe Tidd PFBC Demonstration Plant is a Round 1 Clean Coal Technology Project that was constructed to demonstrate the viability of PFBC combined cycle technology. The addition of a Hot Gas Clean Up (HGCU) stream at Tidd, separately funded by the U.S. Department of Energy as an R&D project, is intended to demonstrate that Advanced Particle Filters (APF) can operate reliably in a PFBC gas stream. The experience gained from these programs is expected to hasten the commercial deployment of the technology and provide a viable power generation option in a time frame consistent with the growing baseload generation needs which are expected to develop early in the next decade.

11982 (DOE/MC/26308–3628) **CE IGCC repowering project: Materials for coal gasification environment: Topical report, June 1993.** Gibbons, T.B.; O'Neill, J.K.; Plumley, A.L.; Thibeault, P.R.; Waryasz, R.W. Combustion Engineering, Inc., Windsor, CT (United States). Oct 1993. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94000097. Source: OSTI; NTIS; GPO Dep.

A task to develop material requirements and a materials testing strategy was established with the Materials and Water Chemistry Department of the ABB Power plant Laboratories. This involved examining the requirements for each system under ABB CE scope. The basis for the material recommendations was largely based on in-house test programs under DOE contract and ABB CE experience. Consultants were utilized in a parallel task to assist in the design and material specification for the solids handling systems. ABB CE experience includes operating data from a former process development unit (PDU) located in Windsor, Connecticut. The unit gasified Pittsburgh seam coal at a nominal firing rate of 120 tons per day. The objectives of the program were to produce clean, low-Btu gas from coal, and to provide the design information for scale-up to commercial-size plants. The results of the task were used to specify and, depending on scope, design the equipment used in the plant. A detailed document was developed and used to generate a Metallurgical Flow Diagram. Specifications were developed from this diagram. For the equipment designed, these selections were provided to representatives of cognizant design and manufacturing departments. In addition, where appropriate, recommendations were made for operating procedures and for design changes. Specified materials will be again evaluated during detailed engineering. In some areas the results of the task were not conclusive. Additional investigation will be required. These areas are the types of approaches which can be taken to accommodate product gas sulfidation resistance and solids transport erosion.

11983 (DOE/MC/26308–3645) **CE IGCC repowering project: Clean Coal II Project: Annual report, 1 January, 1992–31 December, 1992.** Combustion Engineering, Inc., Windsor, CT (United States). Dec 1993. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004063. Source: OSTI; NTIS; GPO Dep.

CE is participating in a $270 million coal gasification combined cycle repowering project that will provide a nominal 60 MW of electricity to City, Water, light and Power (CWL and P) in Springfield, Illinois. The IGCC system will consist of CE's air-blown entrained flow two-stage gasifier; an advanced hot gas cleanup system; a combustion turbine adapted to use low-Btu gas: and all necessary coal handling equipment. The project is currently in the second budget period of five. The major activities during this budgeted period are: Establishment of an approved for design (AFD) engineering package; development of a detailed cost estimate; resolution of project business issues; CWL and P renewal and replacement activities; and application for environmental air permits. The Project Management Plan was updated. The conceptual design of the plant was completed and a cost and schedule baseline for the project was established previously in Budget Period One. This information was used to establish AFD Process Flow Diagrams, Piping and Instrument Diagrams, Equipment Data Sheets, material take offs, site modification plans and other information necessary to develop a plus or minus 20% cost estimate. Environmental permitting activities are continuing. At the end of 1992 the major activities remaining for Budget Period two is to finish the cost estimate and complete the Continuation Request Documents.

11984 (DOE/MC/26308–3648) **CE IGCC repowering project: Controls & instrumentation: Topical report, June 1993.** Combustion Engineering, Inc., Windsor, CT (United States). Dec 1993. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC26308. Order Number DE94004068. Source: OSTI; NTIS; GPO Dep.

The IGCC Control System is used to provide operator interface and controls for manual and auto operation of the IGCC Repowering Project Located at Springfield, Illinois. A Distributed Control System (DCS) is provided for analog (process control) loop functions and to provide the operator interface. A Data Acquisition System (DAS) is provided for gathering performance data and optimization. Programmable Logic Controllers will be provided for the following digital control systems: (a) GSSS (Gasifier Supervisory Safety System) including pulverized coal handling and char handling; (b) Coal Pulverization System; (c) HRSG (Heat Recovery Steam Generation); (d) Hot Gas Cleanup System; (e) Steam Turbine; and (f) Combined Cycle Operation. In general all systems are provided for auto/manual cascade operation; upstream equipment is interlocked to be proven in service operation and/or valve position before downstream equipment may operate.

11985 (DOE/MC/29444–3651) **Toms Creek integrated gasification combined cycle demonstration project: Quarterly report, July 1–September 30, 1993.** Feher, G. Tampella Power Corp., Williamsport, PA (United States). 30 Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC29444. Order Number DE94004069. Source: OSTI; NTIS; GPO Dep.

The use of an upgraded version of General Electric's Frame 6 gas turbine, which has been designated as Frame 6 (FA) will make a significant improvement to the thermal efficiency and overall economics of the Toms Creek Project. Replacing the smaller, less efficient Frame 6 (B) gas turbine with the new Frame 6 (FA) will increase the net power production from a nominal 55 MW to 105 MW. The coal feed rate will correspondingly increase from 430 tpd to 740 tpd. All process flows and equipment sizes will be increased accordingly. Selected process parameters for the original and revised Toms Creek IGCC plant configurations are compared in Table 2. There is an approximately 10% increase in net plant efficiency for the revised configuration. Using this increased plant size, the pressure vessels become larger due to an increased throughput, but are still dimensioned for shop fabrication and over-the-road shipment. The preliminary cost estimate for the enlarged demonstration plant was prepared by factoring the estimates for the original plant. Revised quotes for the larger equipment will be solicited and used to generate more accurate cost information for the revised plant.

11986 (DOE/MC/30097–3627) **Task 3.0: Advanced power systems: Semi-annual report, April 1–June 30, 1993.** McCollor, D.P.; Zygarlicke, C.J.; Mann, M.D.; Willson, W.G.; Hurley, J.P. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Jul 1993. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30097. Order Number DE94000096. Source: OSTI; NTIS; GPO Dep.

A variety of activities are incorporated into the Advanced Power Systems program. Tasks included are (1) fuel utilization properties, (2) pressurized combustion, (3) catalytic gasification, and (4) hot-gas cleanup. ATRAN is stochastic and combines initial coal inorganics in a random manner in order to predict the resulting fly ash particle size and composition. ASHPERT, is an expert system yielding a first-order estimate of fly ash size and composition. Both models are designed to emulate pulverized-coal combustion. Input data required include identity, chemistry, size, quantity, and mineral-to-coal associations. The pressurized combustion task has focused on the construction of a versatile reactor system to simulate pressurized fluidized-bed combustion. Both castable and monolithic refractories have been investigated in determining slag prevention under a variety of conditions. Catalytic gasification coupled with a molten carbonate fuel cell offers an extremely efficient and environmentally sound power generating system using coal. Work with an Illinois No. 6 bituminous coal has not been successful. Continued efforts will focus on using the more reactive low-rank coals to try to achieve this goal. Hot-gas cleanup is the critical issue in many of the proposed advanced power system operations on coal. The key to successful ash removal is an understanding of the properties of the ash to be collected as well as the interactions of this material with the barrier itself. The knowledge base under development will assist in assessing many of these barrier material issues for a variety of coal ashes.

11987 (DOE/METC–93/6131, pp. 7) **Overview: Utility market for advanced coal-fired systems.** Wolk, R. (Electric Power Research Inst., Palo Alto, CA (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE

Contract FC21-91MC27363. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The electric utility industry is entering a period of major transition. New laws and regulations which foster competition in generation, allow transmission access to non-regulated generators, and impose more severe environmental regulations are forcing regulated utility companies to revise their strategies for the future. It is not clear that all regulated utilities will retain their current vertically integrated structure as generators, transmitter, and distributors of electricity. A different structure will create new criteria for the selection of generating technology. As a result, near-term economic performance will become more important than the previous approach of levelizing costs over 30 years. The criteria for selection of new technology will emphasize minimization of capital cost and risk, while meeting all environmental criteria. How will new IGCC and PFBC technologies fare in this radically different market place? It is clear that the current experience base of these technologies at utility sites is limited and each requires capital investments which are about the same as conventional coal-fired plants with back-end cleanup. Environmental performance and efficiency are far superior, however. The status of and potential improvements in IGCC and PFBC technology are reviewed in this paper and utility market niches are identified.

11988 (DOE/METC–93/6131, pp. 8-18) **A utility's perspective of the market for IGCC.** Black, C.R. (Tampa Electric Co., FL (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The market for Integrated Gasification Combined Cycle (IGCC) power plants is discussed and some of the experiments with an Integrated Gasification Combined Cycle Power Plant Project, Polk Unit #1 are described. It was found that not only is the technology different from what most US utilities are accustomed to, but also that the non-technical issues or business issues, such as contracting, project management and contract administration also have different requirements. The non-technical or business issues that are vital to the successful commercialization of this technology are described. These business issues must be successfully addressed by both the utilities and the technology suppliers in order for integrated gasification combined cycle power plants to achieve commercial success.

11989 (DOE/METC–93/6131, pp. 19) **Perspective of the market for PFBC.** Hafer, D.R. (Ohio Power Company, Columbus, OH (United States)); Mudd, M.J. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-87MC24132. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Coal-fired power generation has been the backbone of the electric power industry since its inception. While much of the near-term new capacity needs are expected to be met with simple and combined cycle gas turbine, coal is expected to resume its key role after 2000. The success of coal as a power generating option is inexorably tied to the development of Innovative Clean Coal Technologies (ICCTs). The next decade will provide the opportunity to develop these technologies to maturity and to provide the incentives required to assure deployment. ICCTs will capture an ever increasing portion of the power generation market by striking a balance between the technical, economic, and environmental factors involved in coal combustion.

11990 (DOE/METC–93/6131, pp. 20-25) **Coal future, the impact of IGCCs and PFBCs.** Altmeyer, T.A. (National Coal Association, Washington, DC (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This afternoon I'd like to provide a perspective on the future of coal and follow with a brief video outlining an activity by a number of industry leaders to help facilitate that future. In looking to the future, let's quickly look at the recent past.

11991 (DOE/METC–93/6131, pp. 29-41) **The systems and the developmental targets for PFBC.** Dellefield, R.J. (Morgantown Energy Technology Center, WV (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has been intimately involved in the development of coal combustion using pressurized fluidized beds since the 1970s. This paper presents the reasons why the DOE is pursuing the development and commercialization of Pressurized Fluidized-Bed Combustion (PFBC) systems. First generation PFBC technology is nearing commercial deployment, and the ongoing demonstrations, as part of DOE's Clean Coal Technology (CCT) Program, will enable the technology to be a low-risk, environmentally acceptable option for utilities. Further improvements in environmental and thermal performance will be required to maintain PFBC technology as a competitive option to gasification-based power systems in the 2000s. The cost of electricity, capital costs, emissions, and thermal efficiency of PFBC systems compared to alternatives are covered. The vendors of PFBC systems seem to be responding to these market requirements. Significant progress has been made to increase the efficiency of first generation PFBCs and in reducing the capital cost of first-generation PFBC systems, which should positively influence the number of total sales of new units. The potential for first-generation PFBC systems to be used to retrofit existing utility sites and add a modest increment of power is gaining wide acceptance. Further development of PFBC systems into more efficient, environmentally benign power generation options is continuing. A snapshot of the development activities planned for Advanced PFBC systems, which the DOE considers necessary to develop utility-sized plants, are discussed. The Morgantown Energy Technology Center (METC) is Initiating an effort to investigate the technical issues associated with PFBC systems that can get to over 50 percent efficiencies and have very low emissions. The goals and development targets for this effort will be discussed.

11992 (DOE/METC–93/6131, pp. 42-54) **Second-generation PFBC systems research and development – Phase 2, best efficiency approach in light of current data.** Burkhard, F. (Foster Wheeler Development Corporation, Livingston, NJ (United States)); Carli, G.; Crooker, P.; Froehlich, R.; Kahrs, S.; Kulcsar, D.; Lu, C.; Mack, A.; Malenboym, P.; Nehrozoglu, A.; Torpey, M.; Zoldak, F. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-86MC21023. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Three major objectives of Phase 2 are: (1) Separately test key components [the carbonizer, circulating pressurized fluidized bed combustor (CPFBC), particle-capturing ceramic barrier filter, and topping combustor] of second-generation PFB combustion plants at laboratory scale to ascertain their performance characteristics; (2) Revise the commercial plant performance and economic predictions where necessary; and (3) Prepare for a 1.2-MWe equivalent Phase 3 integrated subsystem test of the key components.

11993 (DOE/METC–93/6131, pp. 86-102) **Second generation PFBC systems research & development, Phase 2 topping combustor development.** Dowdy, T.E. (Westinghouse Electric Corp., Orlando, FL (United States)); Bachovchin, D.; Foote, J.; Pillsbury, P.W.; Bouvier, B.U.; Muller, K.F. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-86MC21023. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Over the past several years, Westinghouse has been part of a US Department of Energy (DOE) sponsored project on a second generation PFB. Led by Foster Wheeler Development Corporation, a team of contractors is developing the second generation PFB technology (Robertson, et al., 1988). Westinghouse's participation relates to gas cleanup - the use of the ceramic cross-flow filter, topping combustor, and the turbomachinery - the steam and gas

turbines. The cycle has been described in detail in previous papers (Garland, et al., 1991).

11994 (DOE/METC–93/6131, pp. 121-128) **Power systems development facility, PFBC system perspectives.** USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-90MC25140. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Southern Company Services (SCS) has investigated the feasibility of constructing a Power Systems Development Facility (PSDF) at the Southern Company's Clean Coal Research Center in Wilsonville, Alabama. The PSDF combines a number of pilot-scale test facilities at a single site to reduce the overall capital and operating cost compared to individual stand-alone facilities, while continuing the DOE/METC's objective of carrying out meaningful systems and component testing for advanced coal-based power generation development. The intent of the PSDF is to provide a flexible test facility that can be used to develop advanced power system components and assess the integration and control issues of these advanced power systems. The facility would provide a resource for rigorous, long-term testing and performance assessment of hot stream cleanup devices in an integrated environment, permitting evaluation of not only the cleanup devices but also other components in an integrated operation.

11995 (DOE/METC–93/6131, pp. 131-133) **The systems and the development targets for IGCC.** Schmidt, D.K. (Morgantown Energy Technology Center, WV (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

For many years, the US Department of Energy (DOE) has been funding research, development, and demonstration (RD&D) projects to develop advanced power generation technologies. The goal of this activity is to catalyze the private sector to commercialize technologies that will provide reasonably priced electricity and still meet stringent environmental standards. Integrated Gasification Combined-Cycle (IGCC) systems are emerging as one of the more attractive candidate technologies to meet this goal. The Morgantown Energy Technology Center (METC) has been assigned the responsibility for implementing IGCC projects in DOE's Clean Coal RD&D program. The IGCC technology offers the potential for significant improvements in environmental performance compared to today's coal-fired power plants. Sulfur dioxide and nitrogen oxide emissions from IGCC systems will be less than one-tenth of existing environmental standards. Thus, the IGCC technology will make coal-based plants as clean as plants that burn natural gas.

11996 (DOE/METC–93/6131, pp. 169-178) **Combustion tests of a turbine simulator burning low Btu fuel and a rich-quench-lean combustor.** Abuaf, N. (GE Environmental Services, Inc., Lebanon, PA (United States)); Feitelberg, A.S.; Hung, S.L.; Najewicz, D.J.; Samuels, M.S. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-87MC23170. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The integrated gasification combined cycle (IGCC) concept represents a highly efficient and environmentally compatible advanced coal fueled power generation technology. When IGCC is coupled with high temperature desulfurization, or hot gas cleanup (HGCU), the efficiency and cost advantage of IGCC is further improved with respect to systems based on conventional low temperature gas cleanup. Commercialization of the IGCC/HGCU concept requires successful development of combustion systems for high temperature low Btu fuel in gas turbines. Toward this goal, a turbine combustion system simulator has been designed, constructed, and fired with high temperature low Btu fuel. Fuel is supplied by a pilot scale fixed bed gasifier and hot gas desulfurization system. The primary objectives of this project are: (1) demonstration of long term operability of the turbine simulator with high temperature low Btu fuel; (2) characterization of particulates in the fuel as well as deposits in the fuel nozzle, combustor, and first stage nozzle; and (3) measurement of NO_x, CO, and particulate emission. In a related project, a reduced scale rich-quench-lean (RQL) gas turbine combustor has been designed, constructed, and fires with simulated low Btu fuel. The overall objective of this work is to develop an RQL combustor with lower conversion of fuel bound nitrogen (FBN) to NO_x than a conventional combustor.

11997 (DOE/METC–93/6131, pp. 233-237) **Catalytic membranes for facilitating the water-gas shift reaction.** Edlund, D.J. (Bend Research, Inc., Bend, OR (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FG03-91ER81229. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This program is directed at furthering the development of a metal-membrane-based process for economically producing pure hydrogen from the raw gasifier stream. A related program is directed at developing a metal-membrane-based process for cleanly and efficiently removing hydrogen sulfide from the hot gas stream. Both of these processes would be accomplished at 500°C to 800°C and are based on a novel hydrogen-permeable composite-metal membrane. Specific program objectives include (1) design, fabrication, and demonstration of pre-prototype membrane modules; (2) improving the membrane composition to increase the hydrogen flux; (3) evaluating membrane lifetime; and (4) conducting engineering and economic analyses of the processes.

11998 (DOE/METC–93/6131, pp. 238-242) **High temperature size selective membranes.** Yates, S.F. (AlliedSignal, Inc., Des Plaines, IL (United States)); Swamikannu, A.X. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-92MC29245. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to develop a high temperature size selective membrane which would be capable of separating gas mixture components from each other based on molecular size, using a molecular sieving mechanism. The membrane would be a composite of a carbon molecular sieve (CMS) with a tightly defined pore size distribution between 3 and 4 Å, and a microporous supporting matrix which provides mechanical strength, and resistance to thermal damage. Such a membrane would enable the separation of hydrogen from carbon dioxide.

11999 (DOE/METC–93/6131, pp. 243-244) **Measurement and modeling of advanced coal conversion processes.** Serio, M.A. (Advanced Fuel Research, Inc., East Hartford, CT (United States)); Hamblen, D.G.; Brewster, B.S.; Radulovic, P.T. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-86MC23075. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to understand the chemical and physical mechanisms in coal conversion processes and incorporate this knowledge in computer-aided reactor engineering technology for the purposes of development, evaluation, design, scale up, simulation, control and feedstock evaluation in advanced coal conversion devices. This technology will be important in reducing the technical and economic risks inherent in utilizing coal. This program is merging advances made at Advanced Fuel Research, Inc. (AFR) in understanding and modeling coal conversion behavior, with technology being developed at Brigham Young University (BYU) in comprehensive computer codes for mechanistic modeling of entrained-bed and fixed-bed gasifiers. During the past year, work continued on the development, evaluation, and application of an advanced 2-D, entrained-bed model for pulverized coal combustion and gasification and a new 1-D model for fixed-bed coal gasification and combustion. Both models incorporate the Functional Group - Depolymerization, Vaporization, Crosslinking (FG-DVC) submodel for predicting coal devolatilization, particle swelling, and char reactivity. Work on this submodel was also completed during the past year. Extensive user's manuals describing the theory and operation of the two codes and the submodels were also prepared.

12000 (DOE/METC–93/6131, pp. 284-294) **Development and demonstration of a wood-fired gas turbine system.** Selzer, B.

(Western Research Institute, Laramie, WY (United States)); Sethi, V. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-86MC11076. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objectives of the test program were (1) to obtain some preliminary information regarding the nature of particulate and vapor phase alkali compounds produced and (2) to assess any deleterious impact they might have on materials of construction.

12001 (DOE/METC–93/6131, pp. 307-314) **PyGas™ design support.** Shadle, L.J. (Morgantown Energy Technology Center, WV (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Morgantown Energy Technology Center (METC) is currently supporting CRS Sirrine Engineers Inc. in their development of the PyGas™ gasification process as part of METC's implementation of the Gasification Product Improvement Facility (GPIF) project. The GPIF is being designed as a 45-Megawatt unit, on a thermal basis, at the site of a utility in north-central West Virginia. The PyGas™ gasifier is a process in which a centrally located fluid-bed pyrolyzer is coupled with a more conventional fixed-bed gasifier. In between these two beds is a freeboard region above the fluidized bed in which gas temperatures are increased via the addition of air to burn tars. This is followed by a cocurrent flow gasifier zone, in which any remaining tars are cracked over a bed of hot char. The goals of this support effort are to address data gaps identified in the PyGas™ process design, including: (1) to investigate solid and gas flow distribution issues, such as channeling, dead zones, compaction, and high pressure drops; (2) to identify optimal operating conditions: air/steam ratios, temperature, pressures, particle sizes, gas velocities, reactor geometries, and tar cracking control; (3) to better define gasification rates and rate improving options for the GPIF coal feeds; and (4) to better define materials properties. The activities to accomplish these goals include the following experimental tasks: at the process scale, design and construct a cold-flow plastic model at one-half the physical dimensions of the demonstration unit; at the laboratory scale, perform tests in atmospheric and pressurized, fixed- and fluid-bed reactors. In addition, computer model codes simulating the fluid dynamics and process chemistry are being adapted and applied. Instrumentation and process concepts will be tested using METC's 10-inch, pressurized, fluid-bed gasifier when feasible.

12002 (DOE/METC–93/6131, pp. 370-382) **Alternative high temperature gas piping systems for PFBC.** Harvey, L.E. (Gilbert/Commonwealth, Inc., Reading, PA (United States)); Zalewski, J.T.; DeLallo, M.R. Jr. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-89MC25177. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this project was to investigate the economic feasibility and comparative advantages of alternative insulated piping systems for pressurized Fluidized-Bed Combustion (PFBC) units. The investigation covered conventional, commercially available products, as well as more advanced, existing solution, including Mirror All Metal Reflective Insulation, and Insulated Steam Injection Tubing (ISIT) which is a double-walled, vacuum-insulated piping system.

12003 (DOE/METC–93/6132, pp. 3-15) **Development of advanced gas turbine systems.** Little, D.A.; Wiant, B.C. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The National Energy Strategy (NES) calls for a balanced program of greater energy efficiency, use of alternative fuels, and the environmentally responsible development of all US energy resources. Consistent with the NES, a DOE program has been created to develop Advanced Turbine Systems (ATS). The technical ATS requirements are based upon two workshops held in Greenville, SC that were sponsored by DOE and hosted by Clemson Univ. The objective of this 8-year program, managed jointly by DOE's Office of Fossil Energy and Office of Energy Efficiency and Renewable Energy, is to develop natural gas fired base load power plants that will have cycle efficiencies greater than 60% (LHV), be environmentally superior to current technology, and also be cost competitive. The program will include work to transfer advanced technology to the coal- and biomass-fueled systems being developed in other DOE programs. The Advanced Turbine Systems program is structured into four elements: (1) innovative cycle development; (2) utility advanced turbine systems; (3) industrial advanced turbine systems; and (4) technology base. Each of these elements is discussed.

12004 (DOE/METC–93/6132, pp. 16-25) **GE power generation technology challenges for advanced gas turbines.** Nourse, J.G. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

GE's view of market needs, in conjunction with the industrial and utility objectives specified for the ATS, have produced a two-pronged approach. This will permit product development in two combined cycle power plant output power ranges, 80-100 MW and 250-350 MW and will be accomplished by (1) development of an Industrial Advanced Turbine System and (2) development of a Utility Advanced Turbine System. Both programs require the identification and resolution of critical technical issues. The emphasis for the Industrial ATS will be placed on innovative cycle design, high temperature materials and low emission combustion. The emphasis for the Utility ATS will be placed on innovative cycle design and the technology advances which will permit a new turbine cooling design will permit a new turbine cooling design while utilizing demonstrated and planned improvements in low emissions combustion.

12005 (DOE/METC–93/6132, pp. 26-32) **Gas fired advanced turbine system.** White, D.J. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective of the first phase of the Advanced Gas Turbine System (ATS) program was the concept definition of an advanced engine system that could meet the program's exacting efficiency and emission goals. The thermal efficiency goal for this advanced industrial engine was set at 50%, some 15 percentage points higher than current equipment levels. Exhaust emissions goals for oxides of nitrogen (NO_x), carbon monoxide (CO), and unburned hydrocarbons (UH) were fixed at 8 parts per million by volume (ppmv), 20 ppmv, and 20 ppmv respectively, corrected to 15% oxygen (O_2) levels. Other goals had to be addressed; these involved reducing the cost of power produced by 10% and improving the reliability, availability, and maintainability over current levels. Although this advanced gas turbine was to be fueled with natural gas, it also had to embody features that allowed easy modification to burn coal or coal derived fuels.

12006 (DOE/METC–93/6132, pp. 33-41) **Advanced turbine systems program.** Mukavetz, D.W.; Knickerbocker, T.K.; Ali, S.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. AC21-86MC23165. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In accordance with the goals of the DOE program, improvements in the gas turbine are the primary focus of Allison activity during Phase I. To this end, Allison conducted a survey of potentially applicable gas turbine cycles and selected the advanced combined cycles and selected the advanced combined cycle as reference system. Extensive analysis of two versions of the advanced combined cycle was performed against the requirement for a 60% thermal efficiency (LHV) utility-sized, natural gas fired system. Allison's October 1992 report to this forum concentrated on the turbine technology required to achieve the ATS system. Regardless of cycle type chosen, the hot section, including combustor, was determined at that time to be the key to success. This 1993 report deals with some of the preliminary screening work done to determine the industrial engine configurations to be studied under Phase II of ATS Task 6.

12007 (DOE/METC–93/6132, pp. 42-66) **Advanced turbine systems - studies and conceptual design.** Gnaedig, G.; Kreitmeier, F. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Present gas turbine based systems are available to achieve thermal efficiencies of 52%-54%. The need for even higher efficiencies in the future, along with low emissions and low operating costs, is apparent and has resulted in programs which are categorized as Advanced Turbine Systems (ATS). The prime objective of this project task is to select a natural gas fired ATS capable of reaching 60% cycle efficiency. Several cycles were compared and evaluated under all different kind of aspects, to determine the one with the highest potential and, at the same time, the best overall fit within an experience base to guarantee project goals. The goals and objectives set for the Advanced Turbine Systems can only be achieved with the introduction of new technology features. Based on ABB's experience over the last 50 years with combustion turbine technology, it was decided that the multi-step development potential of an advanced gas turbine in a combined cycle would offer a greater opportunity to achieve major improvements over the current technology.

12008 (DOE/METC–93/6132, pp. 67-73) **METC combustion research facility.** Halow, J.S.; Maloney, D.J.; Richards, G.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In 1990, an existing Morgantown Energy Technology Center (METC) building, Building 6 or B-6, that had been used to dry and prepare coal for the METC gasifier and other projects was decommissioned. The need for a modern, high-pressure combustion facility was recognized and the decision was made to modernize and upgrade B-6 to meet this need. The objective of the METC high pressure combustion facility is to provide a mid-scale facility for combustion and cleanup research to support DOE's advanced gas turbine, pressurized, fluid-bed combustion, and hot gas cleanup programs. The facility is intended to fill a gap between lab scale facilities typical of universities and large scale combustion/turbine test facilities typical of turbine manufacturers. The facility is now available to industry and university partners through cooperative programs with METC.

12009 (DOE/METC–93/6132, pp. 77-93) **Ceramic retrofit program.** Norton, P.F.; Brentnall, W.D. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The overall objective of the DOE Ceramic Retrofit Program (Stationary Gas Turbine (CSGT) Development Program) is to improve the performance of retrofit stationary gas turbines in cogeneration through the selective replacement of metallic hot section parts with uncooled ceramic components. The successful demonstration of ceramic gas turbine technology, and the systematic incorporation of ceramics in existing and future gas turbines will enable more efficient engine operation, resulting in significant fuel savings, increased output power, and reduced emissions. The program strategy selected provides a strong focus on near term ceramic turbine technology demonstration and lowering barriers for the acceptance of ceramic components by the market place.

12010 (DOE/METC–93/6132, pp. 94-100) **Materials/manufacturing element of the advanced turbine system program.** Karnitz, M.A.; De Van, J.H.; Holcomb, R.S.; Pasto, A.E. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

One of the supporting elements of the Advanced Turbine Systems (ATS) Program is the materials/manufacturing technologies task. The objective of this element is to address critical materials issues for both industrial and utility gas turbines. DOE Oak Ridge Operations Office (ORO) will manage this element of the program, and a team from DOE-ORO and Oak Ridge National Laboratory is coordinating the planning for the materials/manufacturing effort. This paper describes that planning activity which is in the early stages.

12011 (DOE/METC–93/6132, pp. 103-108) **Collaborative advanced gas turbine program.** Cohn, A. (Electric Power Research Institute, Palo Alto, CA (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The Electric Power Research Institute (EPRI), on behalf of its member utility organizations as well as the broader community of users of combustion turbines for power generation, has assumed primary management responsibilities for a new consortium involving elements of both the electric and gas utility industries as well as aircraft engine and gas turbine manufacturers. The objective of the program is to accelerate the commercial availability, to within the turn of the century, of advanced, high-efficiency gas-fired turbines for utility repowering, capacity expansion, and other applications. The consortium - called the Collaborative Advanced Gas Turbine (CAGT) Program - represents a unique combination of gas producers and sellers, electric power generators, and equipment manufacturers aimed at creating the optimum mix of market-pull and technology-push necessary to realize the technical potential for rapidly incorporating the latest aircraft fan-jet engine technology into high-efficiency, low-emission, compact, and modular power plants offer a broad range of possible applications for high-efficiency power generation with the lowest inherent (and even lower achievable) emissions of any fossil fuel based system.

12012 (DOE/METC–93/6132, pp. 109-118) **U.S. Navy intercooled recuperated (ICR) engine.** Bowen, T.L. (Naval Surface Warfare Center, Annapolis, MA (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The U.S. Navy is developing an Intercooled Recuperated (ICR) gas turbine engine for propulsion of future surface ships. The objectives of this development program are to reduce propulsion fuel

consumption by 30 percent, increase maintenance flexibility, improve supportability, enable meeting future emissions standards, and enhance ship mobility. The advanced development phase of this program began in December 1991 with the competitive award of the prime contract to Westinghouse Marine Division in Sunnyvale, California. During the 48-month advanced development phase, the contractor will design, develop, fabricate and test the complete system which is designated with WR-21. This engine is based on the Rolls Royce RB211 family of commercial airline engines. The parent aero engine components are modified to incorporate an intercooler and recuperator into the existing simple cycle engine configuration. The intercooler and recuperator are being developed by Allied Signal Aerospace Systems and Equipment in Torrance, California. Since the majority of ship operating time is spent at low power and low speed, variable area nozzles are incorporated into the RB211 power turbine to maintain high thermal efficiency at off-design conditions. The development of a digital control system for the WR-21 is subcontracted to CAE in Montreal, Canada. This paper presents an overview of the WR-21 design and performance characteristics, and the operational advantages gained with this new engine. The program schedule and status of the development effort are summarized.

12013 (DOE/METC–93/6132, pp. 119-122) **Industry/ University consortium for ATS research.** Golan, L.P. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The Industry/Univ. ATS research program is the result of two planning workshops. Workshop I was held April 8-10, 1991 and had the goal of identifying research needs for advanced gas turbine cycles that would permit rapid commercialization of cycles with significant improvements over the machines currently under development, in terms of the cost of electricity produced and the environmental burdens resulting from their use in power producing. Workshop I was attended by key decision-makers in the gas turbine industry, relevant academic, and involved government technology sponsors. The objective of the overall ATS Program is to develop ultra-high efficiency, environmentally superior, and cost competitive gas turbine systems for base-load application in utility, independent power producer and industrial markets. The overall ATS program has four elements one of which is Technology Base Development which is designed to support the overall program. The Industry/Univ. research consortium is part of the ATS Technology Base Development element and is designed to provide the technology research support required by the program. The research is to be industrial driven, non-proprietary, useful to all, and conducted by the Univ. performing members.

12014 (DOE/METC–93/6132, pp. 125-126) **Welcome - ATS University Workshop.** Golan, L.P. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

A welcome address to the Advanced Turbine System Workshop for Univ. members is presented. This meeting is the first of what is hoped to be many opportunities for the US universities to gather as a single focused body contributing to the national effort to develop advanced electrical power generating systems. The work began nearly two years ago with two Workshops which provided input to DOE on the overall ATS program. These Workshops were attended by over 150 representatives of gas turbine manufacturers, funding organizations, universities and utilities. Workshop I identified ATS R&D needs and the need for R&D coordination. Workshop II further refined the R&D needs, reviewed the concept of R&D coordination and set stringent goals for the ATS program next generation systems. These goals are: (1) ultra high efficiency; (2) environmental superiority; (3) cost competitive; and (4) fuel flexibility.

12015 (DOE/METC–93/6132, pp. 127-133) **University participation in the ATS program.** Golan, L.P. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The Advanced Gas Turbine Systems Research Program (AGTSR) was included in DOE's Advanced Turbine System initiative to conduct basic research in support of the overall ATS program, and to strengthen the univ. gas turbine technology base in the USA. The results of the research will be transferred to the industrial members to enhance and/or facilitate their designs of advanced gas turbine powerplants. Concurrently, the involvement of many students, both graduate and undergraduate, will provide a better qualified group of engineers for hire by the industry.

12016 (DOE/METC–93/6132, pp. 139) **Reduction of turbine endwall total pressure loss and heat transfer using the iceformation design method.** LaFleur, R.S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

This presentation outlines a project to study the iceformation method design of turbine endwall shapes as contoured hubs or shrouds. The controlled phase change process of iceformation allows the flow to directly shape the surface while proceeding toward lowered energy dissipation. The goal of the work is to demonstrate a method for altering near endwall pressure gradients and beneficially affect the complex juncture flow such that total pressure losses and heat transfer from the gas flow are reduced and/or minimized. This will greatly enhance the performance of gas turbines by reducing a primary source of available energy losses. The focus is on high pressure inlet guide vane (two endwalls) turbine geometry where off-design flow has a great impact on overall gas turbine performance. The proposed study uses a linear cascade model to demonstrate the design methodology, resulting geometries, and performance improvements. The research will be conducted by a team of Clarkson University and General Electric engineers with an emphasis on obtaining new designs and educating the next generation of turbine designers.

12017 (DOE/METC–93/6132, pp. 140-141) **Functionally gradient materials for thermal barrier coatings in advanced gas turbine systems.** Marder, A.R. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

New designs for the advanced gas turbine engine for power production will require Thermal Barrier Coatings (TBC) to protect some turbine components. TBC's represent a potential major operational improvement in turbine engine performance by allowing an increase in the maximum inlet temperature for an operating engine. Higher operating inlet air temperature produces a more efficient turbine engine and provides better fuel economy. It has been estimated that TBC application to all high turbine airfoils could save 10 million gallons of fuel annually for a 250 aircraft fleet. Furthermore, the TBC can increase the service lifetime of its coated component providing an added cost benefit. Extending engine maintenance intervals and reducing unscheduled downtime are included in the benefits of thermal barrier coating application. Although thermal

barrier technology is over thirty years old, the principal failure mechanism is still the spallation of the coating. Thermal barrier coating systems have traditionally been comprised of a ceramic outer layer, which provides the thermal barrier, and a metallic bond coat, that protects the substrate alloy from the corrosive combustion gases in the turbine engine. Thermal fatigue damage, in the form of microcracks, accumulates at the TBC/bond coat interface. This damages results from the mismatch in thermal expansion coefficient between the metal bond coat and the ceramic thermal barrier layer. The solution to this problem is to develop a coating that combines the thermal barrier qualities of the ceramic layer and the corrosion protection provided by the metallic bond coat. A ceramic/metal hybrid material that is being developed for just such properties and has been called a Functionally Gradient Material (FGM).

12018 (DOE/METC–93/6132, pp. 142-143) **Vortex-generator induced enhanced heat transfer in gas turbine blade coolant channels with rotation.** Acharya, S.; Myrum, T.A.; Nikitopoulos, D.; Tohline, J. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

A three-year, combined experimental and computational research program will be conducted with the intent of developing a novel technique for augmenting the heat transfer in ribbed gas turbine blade cooling channels. This technique involves placing vortex generators (circular cylinders) in the vicinity of key rib elements so that the vortex street that forms behind the generator excites the shear layers behind the ribs at subharmonics of their most amplified frequency and thereby enhances mixing and heat transfer. The experimental portion of work will involve obtaining local and average Nusselt number results for radially inward and outward flows through a square, rotating ribbed duct, with an without vortex generators. Local and average Nusselt number results will be deduced from mass transfer measurements, using the napthalene-sublimation technique, and the subsequent application of the heat/mass transfer analogy. Hot-wired based flow spectra measurements behind ribs and generator-rib pairs in a rotating duct will also be performed. These measurements will identify the geometrical parameter values leading to the desired subharmonic forcing of the rib shear layers. The computational work will (1) lead to the development of an experimentally validated predictive computer code for the design of gas turbine blade coolant channels with and without vortex generators (2) aid the experimental study by identifying optimal generator-rib configurations, (3) provide detailed velocity, temperature, and heat/mass transfer distributions that will supplement the experimental data, and (4) extend the experimental parameter range. In this portion of the work, the time-dependent Navier-Stokes, energy, and mass concentration equations will be solved using the direct numerical simulation (DNS) technique, which does away with time averaging and conventional modeling approximations.

12019 (DOE/METC–93/6132, pp. 144-145) **Life prediction of advanced materials for gas turbine applications.** Zamrik, S.Y.; Ray, A.; Koss, D.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The long-term performance and reliability of advanced gas turbine systems is critically dependent on damage evolution within the materials operating in the hot sections of the turbine. The accumulation of damage is driven by the temperature-load cycling that a component experiences while its service life depends on the inherent sensitivity of the material to the level of induced damage. A life prediction methodology thus demands not only an accurate assessment of damage evolution on a real-time basis during exposure to service conditions but also a quantitative framework for predicting the component life as a function of damage accumulation. This research proposal focuses on life prediction and long-term performance and reliability of advanced materials for gas turbines. To this effect, experimental and analytical research will be conducted in the following areas: The thermal-mechanical fatigue (TMF) and creep-fatigue behavior of superalloys in coated and uncoated conditions. The above issues are critical to the efficient utilization of high temperature materials in advanced gas turbines for base-load applications. An underlying characteristic of the proposed research is the coordination of the microscale events, namely, damage evolution with the macroscale properties, namely, TMF life and creep life. The major thrust will be directed to life prection of Ni-base superalloys when subjected to thermal-mechanical fatigue (TMF) and creep-fatigue, and their behavior will be examined primarily in the coated conditions. The research efforts in life prediction under TMF cycling and creep-fatigue will be coordinated with the following two industrial partners; namely, Westinghouse Power Generation Technology Division, Orlando, Florida and Garret Engine Division, Allied Aerospace Co., Phoenix, Arizona.

12020 (DOE/METC–93/6132, pp. 146-147) **NO_x abatement in advanced gas turbines.** Sojka, P.E.; Gore, J.P.; Laurendeau, N.M. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The thrust of this proposal is the development of an experimentally verified, computationally efficient, high pressure NO_x submodel for use in designing future generations of gas turbine engines. This submodel (1) will include chemical kinetics capable of predicting NO_x levels at operating pressures and inlet temperatures up to 15 atmospheres and 800 K, (2) will describe turbulence-chemistry interactions by developing and calibrating a new computationally efficient approach that will reduce CPU time, and (3) will be verified by comparing its predictions to data obtained from a high pressure, preheated, natural gas fired gas turbine-analog combustor. The primary deliverable will be a NO_x model including high pressure chemistry and turbulence-chemistry interaction submodels ready for incorporation into all manufacturers' combustor design codes. Secondary deliverables will be the chemical kinetic description of high pressure NO_x formation and the computationally efficient approach for describing turbulence-chemistry interactions. The development of this model will proceed through three interrelated tasks. The first task is to gain a thorough understanding of the chemical kinetics involved in the production of NO in high-pressure natural gas fired systems. The second task is to develop a fundamental understanding, and an accurate and computationally efficient as well as experimentally verified description of the turbulence-chemistry interactions that influence NO_x formation. The third task is to combine the chemical kinetic and turbulence-chemistry interaction submodels and verify their combined performance by comparing their predictions to data taken from carefully controlled experiments performed on an analog gas-turbine combustor.

12021 (DOE/METC–93/6132, pp. 151-164) **Interface between a gas turbine and PFBC.** McGuigan, A.W.; Christenson, J.A.; Howell, I.L.; Marson, E.; Post, M.V.; Risley, T.P.; Vota, T.L. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The combustion turbine is an integral part of the clean coal PFBC power plant. First-generation pressurized fluidized bed combustion (PFBC) technology has potential advantages that include lower capital cost, improved environmental performance, shorter lead times, higher efficiency, and enhanced fuel flexibility. Many advances have been made in this technology as it moves toward commercial demonstration. The objective of this program is to ensure that combustion turbine designs stay current with PFBC

technology, specifically to ensure that the Westinghouse 251B12 combustion turbine is suitable for demonstration phases of this technology as it progresses toward commercial deployment. The preliminary design of system interfaces that permit combining a PFBC and a Westinghouse 251B12 combustion turbine is presented.

12022 (DOE/METC–93/6132, pp. 165-166) **Full-scale and bench-scale testing of a coal-fueled gas turbine system.** LeCren, R.T.; Cowell, L.H.; Galica, M.A.; Stephenson, M.D.; Wen, C.S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Work since the last Heat Engine Conference has been concentrated on completing the following supporting tasks since the main effort was curtailed: (1) Analysis of the candles from the xx hour rig test by Acurex as part of their program (2) Evaluation of the Two Stage Slagging Combustor (TSSC) burning crude oil (3) Continued study of the efferescent fuel injector at Purdue (4) Phase I of the Advanced Turbine Systems program (5) Computational Fluid Dynamic Modeling. Initial testing of the TSSC burning crude oil from the San Joaquin valley in California was accomplished with some preliminary results along with some refractory difficulties. The combustor refractory has been recast and is ready for additional testing. A combined test using crude oil and CWM with the effervescent injectors is envisaged. The studies at Purdue of the effervescent fuel injector have yielded some results which are contradictory to initial hypothesis and development of holographic techniques to evaluate the near nozzle breakup process.

12023 (DOE/METC–93/6132, pp. 167-177) **High pressure ceramic air heater for indirectly-fired gas turbine applications.** Orozco, N.J.; Seger, J.L. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In the past, the conversion of the chemical energy in coal to electric power was restricted to conventional steam cycles due to the ash content of this fuel. External firing would permit the use of coal in a combined gas and steam turbine cycle. The Externally-Fired Combined Cycle (EFCC) is an attractive emerging technology for powering high efficiency combined gas and steam turbine cycles with coal or other ash bearing fuels. In the EFCC, the heat input to the gas turbine is supplied indirectly through a ceramic heat exchanger. The heat exchanger, coupled with an atmospheric coal combustor and auxiliary components, replaces the conventional gas turbine combustor. Addition of a steam bottoming plant and exhaust cleanup system completes the combined cycle.

12024 (DOE/METC–93/6132, pp. 178-185) **Direct coal-fired gas turbines for combined cycle plants.** Wenglarz, R.; Hart, P.; Mongia, H. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Coal is an abundant domestic fuel source and has been evaluated as a turbine fuel in two major programs that started in the late 1940s in the US and later in Australia. Although these projects were only partially successful, later advancements in coal technologies stimulated a renewed interest in coal as a potential source of fuel for commercial gas turbines. The overall goal of this program is to develop and demonstrate the technological bases for economically attractive, commercial, coal-fueled gas turbine systems. Objectives to accomplish this goal include: (1) identify candidate technical approaches to meet the challenges of using coal as a turbine fuel; (2) screen the candidate technical approaches by testing their relative performance and evaluating their effects on the economic attractiveness of commercial coal-fueled systems; and (3) demonstrate the most promising technologies and associated components in proof-of-concept system tests leading up to commercialization.

12025 (DOE/METC–93/6132, pp. 186-198) **Heavy duty gas turbine combustion tests with simulated low BTU coal gas.** Battista, R.A.; Belisle, F.H.; Maxwell, G.P. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

There is an increasing industry interest in integrated gas turbine combined cycle plants in which coal gasifiers provide the fuel for the gas turbines. Some gasifier plant designs, including the air-blown processes, some integrated oxygen-blown processes and some oxygen-blown processes followed by heavy moisturization, produce fuel gases which have lower heating values ranging from 150 to below 100 BTU/scf for which there is little gas turbine combustion experience. This program will provide a set of "screening" tests of the advanced (high temperature) MS7001F combustion system to determine its combustion characteristics with fuels of the nature described above. During 1990 a joint EPRI-Shell-GE program began the combustion "screening" test process with simulated coal gas fuels. Steam was used as a diluent and fuel gas compositions with heating values down to the 110 to 120 BTU/scf region were tested. This DOE-EPRI-GE program links those 1990 results, considers other diluents, considers the $H_2/CO/CO_2$ ratios and drives towards heating values below 100BTU/scf. Program objectives are discussed.

12026 (DOE/METC–93/6132, pp. 199-208) **Combustion tests of a turbine simulator burning low Btu fuel from a fixed bed gasifier.** Abauf, N.; Feitelberg, A.S.; Hung, S.L.; Najewicz, D.J.; Samuels, M.S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

One of the most efficient and environmentally compatible coal fueled power generation technologies is the integrated gasification cycle (IGCC) concept. When IGCC is coupled with high temperature desulfurization, or hot gas cleanup (HGCU), the efficiency and cost advantage of IGCC is further improved with respect to systems based on conventional low temperature gas desulfurization. Commercialization of the IGCC/HGCU concept requires successful development of combustion systems for high temperature low Btu fuel in gas turbines. Toward this goal, a turbine combustion system simulator has been designed, constructed, and fired with high temperature low Btu fuel. Fuel is supplied by a pilot scale fixed bed gasifier and hot gas desulfurization system. The primary objectives of this project are: (1) demonstration of long term operability of the turbine simulator with high temperature low Btu fuel; (2) measurement of NO_x, CO, and particulate emissions; and (3) characterization of particulates in the fuel as well as deposits in the fuel nozzle, combustor, and first stage nozzle.

12027 (DOE/METC–93/6132, pp. 211-221) **Commercialization of coal diesel engines for non-utility and export power markets.** Rao, K.; Balles, E.N.; Benedek, K.R.; Benson, C.E.; Mayville, R.A.; Itse, D.; Kimberley, J.; Parkinson, J. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The primary objective of this METC project is to establish practical, durable components compatible with clean coal slurry fuel and

capable of low emissions. The components will be integrated into a coal power system for a 100-hr proof-of-concept test. The goal of this program is to advance the stationary coal-fueled diesel engine to the next plateau of technological readiness, and thus provide the springboard to commercialization. The basic motivation behind this project is to develop coal-burning heat engine technology primarily for 10-100 MW modular stationary power applications in the late 1990's and beyond, when oil and gas prices may return to the $5-7/MMBtu range. The fuel is a low-cost, coal-based liquid with the consistency of black paint, composed of 12-micron mean size premium 2% ash coal dust mixed 50/50 with water. The Clean Coal Diesel Plant of the future is targeted for the 10-100 MW non-utility generation (NUG) and small utility markets, including independent power producers (IPP) and cogeneration. A family of plant designs will be offered using the Cooper-Bessemer 3.8, 5.0, and 6.3 MW Model LS engines as building blocks. In addition, larger plants will be configured with an engine in the 10-25 MW class.

12028 (DOE/METC–93/6132, pp. 335-344) **Air extraction in gas turbines burning coal-derived gas.** Yang, T.; Agrawal, A.K.; Kapat, J.S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In the first phase of this contracted research, a comprehensive investigation was performed. Principally, the effort was directed to identify the technical barriers which might exist in integrating the air-blown coal gasification process with a hot gas cleanup scheme and the state-of-the-art, US made, heavy-frame gas turbine. The primary objective of this study was to determine how extracting compressed air from a heavy-frame gas turbine affects (1) the total pressure loss in the compressor discharge casing (CDC), also referred to as the compressor/combustor pre- and dump diffusers: (2) the airflow distribution around the combustors and transition pieces; and (3) the pressure losses in the extraction manifold. Another objective of this work was to characterize the flow field in the prediffuser and the dump diffuser for identifying the major pressure loss mechanisms. The final objective was to establish an experimental facility which can be used to assist the US industry in improving the aerodynamic design of nonrotating components of heavy-frame gas turbines.

12029 (DOE/METC–93/6132, pp. 345-354) **Development of a dry-feed system for a coal-fired gas turbine.** Smith, C.F.; Rothrock, J.W. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective of the reported work is to develop a dry coal feed system that provides smooth, controllable flow of coal solids into the high pressure combustor of the engine and all test rigs. The system must start quickly and easily, run continuously with automatic transfer of coal from low pressure hoppers to the high pressure delivery system, and offer at least a 3:1 smooth turndown ratio. Cost of the equipment must be minimized to maintain the economic attractiveness of the whole system. The work was in support of Allison's Coal Fired Gas Turbine contract. Feed systems were needed both for the bench scale combustion rig and the full scale combustion rig and engine. The mass flow scale factor between these two units is ten to one. Nominally, the bench scale unit requires 500 pounds per hour of dry coal flow, and the full scale system needs 5000 pounds per hour. This variation in requirement meant no one feed unit could satisfy both. Two separate units were specified and ordered. Ultimately, a third was acquired for the bench scale rig due to the failure of the first.

12030 (DOE/METC–93/6132, pp. 355-365) **METC research on coal-fired diesels.** McMillian, M.H.; Robey, E.H.; Addis, R.E. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The METC in-house Coal-Fueled Diesel Research project is part of the DOE effort to develop a technology base for diesel engines capable of operating on coal, shale oil or low-cost coal-derived fuels. The in-house effort started in 1985 as a test-bed for coal-derived liquid fuels and will end this fiscal year with the successful completion of METC's diesel R&D program. Currently METC in-house research and development efforts focus on pilot chamber combustion in METC's coal-water slurry (CWS) fueled diesel engine. A novel pilot chamber for a direct-injected, coal-fueled diesel engine has been designed and is being tested in METC's single cylinder research diesel engine. The pilot chamber configuration allows for operation at extended load and speed conditions using 100 percent CWS and no other pilot fuel. THe concept involves the use of a small volume chamber exterior to the main cylinder in which approximately 5 percent of the total fuel energy at full load conditions is injected. Lower NO_x levels may be obtained due to leaner burning as well as broader stable performance using only CWS fuel.

12031 (DOE/METC–93/6132, pp. 366-372) **Pressure-gain combustion.** Richards, G.A.; Gemmen, R.S.; Yip, J.; Janus, M.C.; Norton, T.; Rogers, W.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Pulse combustion has been proposed for gas turbine applications, and more recently has been demonstrated to produce so-called "pressure-gain" in a small gas turbine. The basic concept is that the oscillatory combustion occurs as a constant-volume process, producing a gain in the stagnation pressure of air flowing through the combustor, rather than the pressure loss associated with conventional, steady combustion. If properly utilized, this pressure-gain could enhance simple-cycle gas turbine efficiency several percent, depending on the operating conditions. In addition, pulse combustors have demonstrated relatively low NO_x pollutant levels in some applications. The combined potential for higher cycle efficiency and lower pollutant levels is the basis for the present investigation. Tests in progress at the Morgantown Energy Technology Center (METC) have considered a baseline pulse combustor configuration that has shown good oscillating performance, low NO_x emissions, but disappointing results in terms of pressure-gain. However, a combination of numeric simulations and test data suggest that pressure-gain can be produced by a select combination of operating conditions and combustor geometry, but is especially sensitive to the combustor inlet geometry. Tests in progress will evaluate the effect of inlet geometry and operating pressure on both pollutant emissions and pressure-gain.

12032 (DOE/METC–93/6132, pp. 376-382) **Premixed burner studies of NO_x formation and control.** Castleton, K.H. (Morgontown Energy Technology Center, WV (United States)); Straub, D.L.; Moran, C.; Stephens, J.W. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The demand for efficient, environmentally sound energy sources provides substantial incentive for the development of gas turbine systems with very low NO_x emissions characteristics. Further, the development of low NO_x burners that are capable of utilizing low-heating-value gases derived from coal-based systems is an essential component for a number of fossil energy technologies including IGCC and second-generation PFBC. The overall goal of this

lab-scale project is to support the accelerated development of low NO_x, low CO emissions combustors for heat engines burning natural gas or coal-derived fuels. This will be accomplished through a combination of lab-scale burner studios and chemical kinetic modeling activities. In this way, improved NO_x control methodologies as well as more reliable instrumentation systems and techniques can be identified and implemented for larger scale systems.

12033 (DOE/PC/90545–T10) **Full-scale demonstration Low-NO_x Cell™ Burner retrofit: Quarterly report No. 8, 1 July, 1992–30 September, 1992: Revision 1.** Babcock and Wilcox Co., Alliance, OH (United States). 25 Oct 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-91PC90545. Order Number DE94007993. Source: OSTI; NTIS; GPO Dep.

The Full Scale Demonstration Low-NO_x Cell™ Burner (LNCB™) project involves retrofitting the two-nozzle cell burners at Dayton Power and Light's, 605 MW(e) J.M. Stuart Unit No. 4 boiler near Aberdeen, Ohio with LNCB™ (a burner and integral No_x port). Previous pilot-scale tests have shown such an arrangement to achieve 50% reduction in NO_x emission levels. This full-scale project will determine the commercial applicability of this technology. Long-term testing via a Continuous Emission Monitor (CEM) began in August, 1992. CEM testing will continue until Spring of 1993 when Unit No. 4 comes off line for its annual outage which at this time is scheduled for April 4, 1993. A key item remaining to be evaluated as part of the long term testing is furnace tube wall corrosion. H_2S probing similar to optimized test probing was repeated during the week of August 17, 1992. During the Spring '93 outage, ultrasonic testing of the furnace wall tubes as well as destructive examination of samples from the corrosion test panel will be accomplished.

12034 (SAND–93-3899) **Utility Battery Storage Systems Program report for FY93.** Butler, P.C. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007583. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories, New Mexico, conducts the Utility Battery Storage Systems Program, which is sponsored by the US Department of Energy's Office of Energy Management. In this capacity, Sandia is responsible for the engineering analyses, contract development, and testing of rechargeable batteries and systems for utility-energy-storage applications. This report details the technical achievements realized during fiscal year 1993.

12035 (SAND–94-0527C) **Coproduction of electric power and Fischer-Tropsch products (CATL-078).** Gray, D. (Mitre Corp., McLean, VA (United States)); Tomlinson, G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940301–18: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94007065. Source: OSTI; NTIS; GPO Dep.

Because the coal gas produced from modern coal gasifiers can be purified to be compatable with slurry-phase F-T systems, it is feasible to integrate F-T synthesis with an IGCC facility to coproduce clean electric power and excellent quality nation fuels with high overall efficiency. This is similar in concept to coproducing electric power and methanol in a once-through process, and the feasibility of this concept has been extensively studied by EPRI. In the once-through methanol concept, the methanol could be used as peaking fuel in the power plant or sold as a chemical or fuel. This paper analyses this once-through F-T concept to determine the cost and efficiency advantages of a facility that coproduces power and transporation fuels compared to stand-alone IGCC and F-T facilities. The results of this analysis indicate that a coproduction facility can reduce the required selling price of transportation fuels by up to 15 percent compared to stand-alone facilities, and do so with no additional cost of electric power over the stand-alone IGCC case. This cost savings can also be achieved at a higher overall efficiency. Such a coproduction facility may allow coal-based IGCC technology to penetrate more rapidly into the marketplace. An independent power producer (IPP) may find this concept attractive since it allows the flexible production of power (for load following) and fuel as dictated by demand with no overall loss of plant capacity. In addition, the risk of plant investment is lowered by producing products for two markets.

12036 (VTT-TIED–1451-Pt.4) **New alternatives for electricity production: Performance of peat-fuelled air gasification combined-cycle power plants.** Solantausta, Y. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Fuel and Process Technology); Maekinen, T.; Kurkela, E.; Sipilae, K. Technical Research Centre of Finland, Espoo (Finland). 1993. 77p. Order Number DE94722004. Source: OSTI; NTIS.

JALO Research Programme.

The objectives of the study were preparation of the process design and flowsheets and mass and energy balances for two peat-fuelled gasification combined cycles: one using the present technology and the other the potential technology; and a continued development of a consistent set of techno-economic evaluations of new biomass fuelled combined-cycle power plants under development A process analysis computer program, ASPEN PLUS™, was used as the basic framework for performing the energy and material balances. Although the programme was not developed especially for power plant design, it is quite suitable for this application due the features of integrated gasification- combined cycles. Both cogeneration power plant concepts were designed around an existing gas turbine. The major differences between the two concepts were the gas turbine combustion temperature (1 120/1 300 deg C), and the method of gas cleaning (col/hot). The power production efficiency of the present case was 41 % and that of the potential case 45 %. The power-to-heat ratio increased from 0.91 to 1.03, when potential technology was applied. The potential case is quite promising for cogeneration, since, in addition to the high efficiency, its capital costs should be lower than those of the present case. Gasification-combined cycles should be of extreme interest for utilities, since their high power-to-heat ratio of about 1.0 is favourable compared with 0.5, typical of conventional solids-fuelled cogeneration power plants.

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12037 (CONF-930787–6) **Concept selection for advanced low-emission coal fired boiler.** Gorrell, R.L. (Babcock and Wilcox Co., Barberton, OH (United States)); Rodgers, L.W.; Farthing, G.A. Babcock and Wilcox Co., Alliance, OH (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92160. From 9. annual coal preparation, utilization, and environmental control contractors' conference; Pittsburgh, PA (United States); 19-22 Jul 1993. Order Number DE94006989. Source: OSTI; NTIS; GPO Dep.

The Babcock & Wilcox Company (B&W), under contract to the US Department of Energy (DOE) with subcontract to Physical Sciences, Inc. (PSIT), the Massachusetts Institute of Technology (MIT) and United Engineers and Constructors (UE&C) has begun development of an advanced low-emission boiler system (LEBS). The initial phase of this multi-phase program required a thorough review and assessment of potential advanced technologies and techniques for control of combustion and flue gas emissions. Results of this assessment are presented in this paper.

12038 (CONF-9309152–Vol.1, pp. 129-146) **Performance and operating results from the demonstration of advanced combustion techniques for wall-fired boilers.** Sorge, J.N. (Southern Company Services, Inc., Birmingham, AL (United States)); Baldwin, A.L. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper discusses the technical progress of a U.S. Department of Energy Innovative Clean Coal Technology project demonstrating advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers.

The primary objective of the demonstration is to determine the long-term performance of advanced overfire air and low NOx burners applied in a stepwise fashion to a 500 MW boiler. A 50 percent NOx reduction target has been established for the project. The focus of this paper is to present the effects of excess oxygen level and burner settings on NOx emissions and unburned carbon levels and recent results from the phase of the project when low NOx burners were used in conjunction with advanced overfire air.

12039 (CONF-9309152–Vol.1, pp. 147-168) **Measurement of air toxic emissions from a coal-fired boiler equipped with a tangentially-fired low NOx combustion system.** Bismukes, E.B. (Southern Research Institute, Birmingham, AL (United States)); Clarkson, R.J.; Hardman, R.R.; Elia, G.G. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper presents the results of measurements of chemical emissions from a coal-burning, tangentially-fired, utility boiler equipped with a hot-side electrostatic precipitator and a low NOx firing system. The tests were conducted in response to Title III of the 1990 Amendments to the Clean Air Act which lists 189 chemicals to be evaluated as "Air Toxics". The project was jointly funded by the Electric Power Research Institute and the U.S. Department of Energy under an existing Innovative Clean Coal Technology Cooperative Agreement managed by Southern Company Services. Field chemical emissions monitoring was conducted in two phases: a baseline "pre-low NOx burner" condition in September 1991 and in the LNCFS Level III low NOx firing condition in January 1992. In addition to stack emissions measurements of both organic and inorganic chemicals, plant material balance evaluations were performed to determine the efficiency of the hot-side ESP at controlling emissions of air toxics and to determine the fate of the target chemicals in various plant process streams.

12040 (CONF-9309152–Vol.1, pp. 169-203) **Results of Babcock & Wilcox's clean coal technology combustion modification projects: Coal reburning for cyclone boiler NO_x control and low NO_x cell$_{TM}$ burner demonstrations.** Yagiela, A.S.; Laursen, T.A.; Maringo, G.J.; Kleisley, R.J.; Farzan, H.; Bellanca, C.P.; Duong, H.V.; Moore, D.A.; Campbell, J.M.; Newell, R.J.; Corbett, R.W. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

Cyclone furnaces were developed by Babcock & Wilcox (B&W) to effectively combust low quality fuels. B&W's Cell burners were designed to maximize heat release in the boiler to improve efficiency. These objectives were readily achieved through intense combustion and resulting high temperatures; a condition generating disproportionately high levels of NO_x. Each technology represents approximately 13% of pre-New Source Performance Standards (NSPS) coal-fired generating capacity. B&W, co-sponsored by Electric Power Research Institute (EPRI), the host utilities and utility co-funding sponsors through U.S. Department of Energy (DOE) Clean Coal Technology Demonstration projects, addressed the NO_x reduction needs of utilities using cyclones and cell burners. The Ohio Coal Development Office (OCDO) also sponsored the cell burner project as part of its own Clean Coal Technology Program. Coal reburning to reduce NO_x emissions by at least 50% from cyclones was demonstrated at Wisconsin Power and Light Company's (WP&L) 110 MW_e Nelson Dewey Generating Station. The Low-NO_x Cell^{TM} burner (LNCB^{TM}) reducing NO_x emissions by at least 50% was demonstrated at the 605 MW_e Unit No. 4 at Dayton Power & Light Company's (DP&L) J.M. Stuart Station. Both emissions and overall boiler performance test results for each Clean Coal Technology Demonstration are presented in this paper.

12041 (CONF-9309152–Vol.1, pp. 205-225) **Gas reburning and low NO_x burners on a wall-fired boiler.** Hong, C.C. (Energy and Environmental Research Corp., Orrville, OH (United States)); Light, J.M.; Moser, H.M.; Sanyal, A.; Sommer, T.M.; Folsom, B.A.; Payne, R.; Ritz, H.J. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

Parametric tests were conducted for a Gas Reburning-Low NO_x Burner system on a 172 MWe (gross) wall-fired boiler. At 150 MWe net load, the initial low NO_x burner design reduced NO_x emissions from 0.73 lb/10^6 Btu (215 mg/MJ), a 31 percent overall reduction. At the same net load, with Gas Reburning-Low NO_x Burner operation using 20 percent of total heat input provided by natural gas, NO_x emissions were reduced further to 0.20 lb/10^6 Btu (86 mg/MJ), a 72 percent overall reduction. These short-term NO_x emissions remained fairly constant when gas heat input ranged from 16 to 23 percent. NO_x emissions decreased linearly with decreasing excess air level at the boiler exit. At baseline or pre-LNB, GR conditions, CO was less than 200 ppm. Baseline carbon loss was less than 6 percent carbon in the ash. The Gas Reburning-Low NO_x Burners operation and the Low NO_x Burners operation produced CO and carbon in ash in these ranges. The heat rate was increased by about 1 percent in the Gas Reburning-Low NO_x Burner operation. Long-term demonstration testing based on automatic, load-following operation started in April 1992 and initial long-term NO_x results agreed with the parametric test results at the same excess air levels.

12042 (CONF-9309152–Vol.1, pp. 243-270) **Design methodology for micronized coal reburn system using modeling.** Kosvic, T.C.; Bortz, T.F.; Howlett, C.L. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The Tennessee Valley Authority (TVA) has been selected by the Department of Energy's Clean Coal Technology IV program to demonstrate micronized coal reburn technology for control of nitrogen oxide (NO_x) emissions. The demonstration will be done at full scale on a 175 MWe wall-fired steam generator at the Shawnee Fossil Plant. The micronization technology of the Fuller Corporation makes this demonstration feasible, hence, TVA has selected Fuller as the prime contractor for the project and partner in the commercialization of the technology. Radian Corporation has been selected to define the combustion and mixing aspects of the demonstration. Radian Corporation will thus define the design of the reburn injection and OFA system to be installed. This retrofit demonstration is expected to decrease NO_x emissions by 50 to 60 percent. Up to 30 percent of the total fuel fired in the furnace will be micronized coal injected in the upper furnace creating a fuel-rich reburn zone. Overfire air will be injected at conditions that will attain good furnace gas mixing above the reburn zone to insure complete combustion. This paper outline the efforts to be conducted in defining the key parameters associated with injection and mixing of the micronized coal reburning media and the overfire air (OFA). Shawnee Station is indicative of a large portion of boilers in TVA's and the nation's utility operating base. Micronized coal reburn technology compares favorably with other NO_x control technologies and yet offers additional performance benefits.

12043 (CONF-9309152–Vol.1, pp. 273-290) **York County energy partners ACFB demonstration project status.** Wang, S.I. (Air Products & Chemicals, Inc., Allentown, PA (United States)); Bolinsky, F.T. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The York County Energy Partner, L.P. project, to be located in York County, Pennsylvania, will demonstrate the world's largest atmospheric circulating fluidized bed (ACFB) boiler under sponsorship of the U.S. Department of Energy's Clean Coal Technology I Program. The single ACFB boiler, designed by Foster Wheeler Energy Corporation, will supply 227 MWe of net electrical power and export up to 400,000 lb/hr of steam to an adjacent paper mill. This paper outlines the project summary, process description, changes

due to site relocation, the value improvement of boiler island and current status of the project.

12044 (CONF-9309152–Vol.1, pp. 291-300) **Pressurized circulating fluidized bed demonstration project.** Kruempel, G. (Midwest Power, Des Moines, IA (United States)); Ambros, S.; Provol, S.; Bjeldanes, M. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The Des Moines Energy Center (DMEC) Project will be the first commercial scale demonstration of Pyropower Corporation's PYROFLOW® Pressurized Circulating Fluidized Bed (PCFB) technology. The project will be a repowering of an existing steam turbine at the DMEC site. The design incorporates a hot (1,600°F) particulate removal system and operates in a combined cycle configuration for increased plant efficiency. The DMEC-1 limited partnership, with Dairyland Power as the limited partner and Midwest Power, formerly Iowa Power, as the general partner, will be the participant for the project. the project was selected in the Clean Coal Technology Round 3 solicitation. The partnership signed the Cooperative Agreement with the DOE in May 1991. In August 1991, Midwest Power, Dairyland Power Cooperative, Pyropower Corporation, and Black & Veatch initiated the preliminary design of the PCFB Repowering Project. During the preliminary design process, plant and system layouts have been completed, subsystem specifications have been prepared, and cost and schedule baselines have been updated. Process verification testing for hot gas filter equipment, gas turbine materials, and fuel selection has continued at the Ahlstrom PCFB Testing Facility in Karhula, Finland. Testing results have shown the need to continue this testing prior to finalization of the ceramic filter system selection.

12045 (CONF-9309152–Vol.1, pp. 319-338) **Demonstration of Bechtel's confined zone dispersion process at Pennsylvania Electric Company's Seward Station project status.** Battista, J.J. Jr.; Abrams, J.Z.; Rubin, A.G.; Baldwin, A.L. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The U.S. Department of energy and Bechtel Corporation are cooperating in a joint project to demonstrate Bechtel's Confined Zone Dispersion (CZD) Technology. The demonstration is being conducted at Pennsylvania electric Company's (Penelec's) Seward Station on boiler Unit No. 15. This boiler is a 147 MWE pulverized coal-fired unit, which utilizes Pennsylvania bituminous coal (approximately 1.2 to 2.5 percent sulfur). One of the two flue gas ducts leading from the boiler was lengthened and retrofitted with the CZD technology. The new long straight duct replaced the original multibend duct to ensure a residence time of about 2 seconds. The goal of this demonstration is to prove the technical and economic feasibility of the CZD technology on a commercial scale. The process can achieve 50 percent sulfur dioxide SO_2 removal at lower capital and O&M costs than other systems. The CZD process involves injecting a finely atomized slurry of reactive lime into the flue gas ductwork of a coal-fired utility boiler. The principle of the confined zone is to form a wet zone of slurry droplets in the middle of the duct confined in an envelop of hot gas between the wet zone and the duct walls. The lime slurry reacts with part of the SO_2 in the gas and the reactive products dry of form solid particles. An electrostatic precipitator (ESP), downstream from the point of injection, captures the reactive products along with the fly ash entrained in the flue gas.

12046 (CONF-9309152–Vol.1, pp. 339-356) **Project update: Advanced FGD design for Northern Indiana Public Service Company's Bailly Generating Station.** Henderson, J. (Pure Air, Allentown, PA (United States)); Vymazal, D.C.; Wrobel, B.A.; Sarkus, T. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

In 1988, the U.S. Department of Energy selected Pure Air to demonstrate of state-of-the-art sulfur dioxide scrubber, under DOE's Clean Coal Technology demonstration program. the scrubber is located at the Northern Indiana Public Service Company's (NIPSCO's) Bailly Generating Station, approximately 40 miles southeast of the city of Chicago, Illinois in the U.S.A. It boasts a number of advanced technical features, including a single absorber vessel which is sized nominally at 600 MWe - the largest in the United States, and the largest in the world to operate with high-sulfur coal. Other project features are: (1) high-velocity co-current scrubber design, which contributes to reduced space requirements; (2) direct injection of dry, pulverized limestone into the scrubber; (3) production of high quality gypsum by-product, instead of disposable scrubber sludge; (4) wastewater treatment and evaporation system, and; (5) the first-of-a-kind agreement (Own-and-Operate) to design, engineer, construct, fabricate, own, operate, maintain and finance a power plant scrubber, by a non-utility. These and other features allow the scrubber to have improved environmental performance, reduced space requirements, better energy efficiency, and lower costs than conventional first (or second) generation scrubbers. With specific regard to environmental management, this project seeks to demonstrate that air pollution control need not have deleterious solid waste and/or wastewater consequences. Construction of the scrubber is complete; operations began in June 1992, ahead of schedule and within budget. This paper reviews the advanced wet flue gas desulfurization (FGD) design features, and the environmental and business features of the project. This paper also includes operations data, project costs and schedule.

12047 (CONF-9309152–Vol.1, pp. 357-378) **The clean coal technology program 10 MWe demonstration of gas suspension absorption for flue gas desulfurization.** Hsu, F.E. (AirPol Inc., Teterboro, NJ (United States)); Bhagat, B.R.; Nadkarni, S.K.; Marchant, S.K.; Norwood, V.M.; Burnett, T.A. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper presents a description and the initial test results of the Gas Suspension Absorption technology demonstration in the Clean Coal Technology project entitled "10 MW Demonstration of Gas Suspension Absorption." AirPol is currently performing this demonstration with the cooperation of the Tennessee Valley Authority under a Cooperative Agreement with the United States Department of Energy. This low-cost retrofit project seeks to demonstrate the Gas Suspension Absorption system, which is expected to remove more than 90% of the sulfur dioxide from coal-fired flue gas, while achieving a high utilization of reagent lime.

12048 (CONF-9309152–Vol.1, pp. 379-391) **LIFAC sorbent injection for flue gas desulfurization.** Viiala, J. (Tampella Power Corp., Atlanta, GA (United States)); Pokki, T.; Hervol, J.; Huffman, I. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper discusses the demonstration of LIFAC sorbent injection technology at Richmond Power and Light's (RP&L) Whitewater Valley Unit No. 2 under the auspices of the U.S. Department of Energy's (DOE) Clean Coal program. LIFAC is a sorbent injection technology capable of removing 75 to 85 percent of a powerplant's SO_2 emissions using limestone at calcium to sulfur molar ratios of between 2 and 2.5 to 1. The site of the demonstration is a coal-fired electric utility powerplant located in Richmond, Indiana, which is between Indianapolis, Indiana and Dayton, Ohio. The project is being conducted by LIFAC North America, a joint venture partnership of Tampella Power Corporation and ICF Kaiser Engineers, in cooperation with DOE, RP&L, and several other organizations including the Electric Power Research Institute (EPRI), the State of Indiana, and Black Beauty Coal Company.

12049 (CONF-9309152–Vol.1, pp. 393-405) **Chiyoda thoroughbred 121 innovative clean coal technology demonstration project initial testing results.** Burford, D.P. (Southern Company

Services, Birmingham, AL (United States)); Pearl, I.G.; Ritz, H.J. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

The Chiyoda CT-121 Project at Georgia Power's Plant Yates Unit No.1 is a Round II, $36 million, Innovative Clean Coal Technology project co-funded by the Department of Energy, the Electric Power Research Institute and The Southern Company. The CT-121 scrubbing process features a single SO_2 absorption module, called the Jet Bubbling Reactor (JBR), made entirely of fiberglass reinforced plastics (FRP) where several chemical reactions (absorption/neutralization/oxidation/crystal growth) take place concurrently. The 100 MWe flue gas scrubber uses ground limestone to remove up to 95% of the SO_2 in the flue gas from a pulverized coal-fired boiler, producing a high quality gypsum by-product. Gypsum will be deposited in a gypsum "stack", a disposal technique commonly used in the phosphate fertilizer industry. Operational testing, continuing through early 1995, will include sustained high performance testing, simultaneous particulate removal in the JBR, alternate limestone and alternate higher sulfur coal. Initial results from parametric testing have demonstrated the excellent SO_2 removal and particulate removal performance of this unique flue gas desulfurization technology.

12050 (CONF-9309152–Vol.1, pp. 409-422) **Industrial pollution control: 1993 performance update of the recovery scrubber.** Morrison, G.L. (Passamaquoddy Technology, L.P., Thomaston, ME (United States)). Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

A cement plant application of the Passamaquoddy Technology Recovery Scrubber pollution control process, an Innovative Clean Coal Technology Program project, began initial operation at the Dragon Products Company Inc. plant in Thomaston, Maine in December, 1990. During 1991 and 1992 several changes were made to improve on-line time and system reliability. Performance of the system, now in full time operation, is discussed. Results of flue gas scrubbing and waste reclamation are given. changes that have been made, and their impact on system reliability are explained. Marketing efforts and potential future applications are reviewed.

12051 (CONF-9309152–Vol.1, pp. 467-482) **Status of coal tech's air cooled slagging combustor.** Zauderer, B. (Coal Tech Corp., Merion Station, PA (United States)); Fleming, E.S.; Borck, B.; Baldwin, A.L.; Smith, C.A.; Gyorke, D. Southern States Energy Board, Atlanta, GA (United States). 9 Sep 1993. From 2. annual clean coal technology conference; Atlanta, GA (United States); 7-9 Sep 1993. In *Second annual clean coal technology conference: Proceedings: Volume 1.* 482p. Order Number DE94004473. Source: OSTI; NTIS; INIS.

This paper summarizes the status of a six year development effort on a 20 MMBtu/hr slagging, coal combustor that was retrofitted to an oil designed package boiler. In addition to the efficiency benefits of regenerative air cooling, the combustor internally controls SO_2 and NO_x emissions. The combustor also substantially reduces dioxin emissions from coal and from coal cofired with refuse derived fuel. It has vitrified fly ash containing a wide range of unburned carbon. To date, the combustor has operated for about 1600 hours, with about on-half of this time on coal, and the balance on oil and gas. Current test efforts are focused on automatic computer control of the system and cost analyses have been performed on applications of the combustor to retrofit and repower industrial boilers and combined gas turbine-steam turbine power plants. Installed retrofit costs for the combustor are estimated at under $10/lb of steam for industrial boilers, and from $86/kW for small power plants to $172/kW for a 250 MW power plant. The estimated cost of a 20 MW greenfield combined cycle plant system is in the $1200 to $1400/kW range.

12052 (DOE/FE–94007444) **Clean Coal Technology: Reduction of NO_x and SO_2 using gas reburning, sorbent injection, and integrated technologies: Topical report No. 3, Revision 1.** USDOE, Washington, DC (United States); Energy and Environmental Research Corp., Irvine, CA (United States). Sep 1993. 32p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007444. Source: OSTI; NTIS; GPO Dep.

The Clean Coal Technology Demonstration Program (also referred to as the CCT Program), is a unique government/industry cost-shared effort to develop these advanced coal-based technologies. The CCT Program provides numerous options for addressing a wide range of energy and environmental issues, including acid rain, global climate change, improved energy efficiency, energy security, and environmental qualitiy. It is intended to demonstrate a new generation of full-scale, "showcase" facilities built through the United States. Gas Reburning, Sorbent Injection and Integrated Technologies – the subject of this Topical Report – are one such set of promising innovative developments. In addition to discussing the technologies involved, this report will describe two specific projects, results to date, and the commercial promise of these processes. The objectives of Gas Reburning and Sorbent Injection were to have a 60% reduction in NO_x emissions and a 50% reduction in SO_2 emissions. These objectives have been achieved at the tangentially-fired boiler at the Hennepin site of Illinois Power and at the cyclone-fired boiler operated by City Water, Light and Power in Springfield, Illinois. The other project, Gas Reburning and Low NO_x Burners had the goal of a 70% NO_x reduction from the wall-fired boiler operated by Public Service of Colorado at Denver. In early preliminary testing, this goal was also achieved. Energy and Environmental Research (EER) is now ready to design and install Gas Rebunting and Sorbent Injection systems, and Gas Reburning-Low NO_x, Burner systems for any utility or industrial application. These technologies are offered with performance and emission control guarantees.

12053 (DOE/MC/24257–3687) **Integrated Low Emissions Cleanup system for direct coal fueled turbines, (moving bed, fluid bed contactor/ceramic filter): Twenty-fourth quarterly status report, July–September 1993.** Newby, R.A.; Alvin, M.A.; Bachovchin, D.M.; Yang, W.C.; Smeltzer, E.E.; Lippert, T.E. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1993]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24257. Order Number DE94008635. Source: OSTI; NTIS; GPO Dep.

The United States Department of Energy, Morgantown Energy Research Center (DOE/METC), is sponsoring the development of direct coal-fired turbine power plants as part of their Heat Engines program. A major technical challenge remaining for the development of the direct coal-fired turbine is high-temperature combustion gas cleaning to meet environmental standards for sulfur oxides and particulate emissions, as well as to provide acceptable turbine life. The Westinghouse Electric Corporation, Science & Technology Center, is evaluating two Integrated Low Emissions Cleanup (ILEC) concepts that have been configured to meet this technical challenge: a baseline ceramic barrier filter ILEC concept, and a fluidized bed ILEC concept. These ILEC concepts simultaneously control sulfur, particulate, and alkali contaminants in the high-pressure combustion gases at turbine inlet temperatures up to 2300°F. This document reports the status of a program in the nineteenth quarter to develop this ILEC technology for direct coal-fired turbine power plants.

12054 (DOE/MC/25022–3619) **The development of a porous silicon nitride crossflow filter: Final report, September 1988–September 1992.** Allied-Signal Aerospace Co., Torrance, CA (United States). AiResearch Los Angeles Div. Sep 1992. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC25022. Order Number DE94000088. Source: OSTI; NTIS; GPO Dep.

This report summarizes the work performed in developing a permeable form of silicon nitride for application to ceramic crossflow filters for use in advanced coal-fired electric power plants. The program was sponsored by the Department of Energy Morgantown Energy Technology Center and consisted of a design analysis and material development phase and a filter manufacture and demonstration phase. The crossflow filter design and operating requirements were defined. A filter design meeting the requirements

was developed and thermal and stress analyses were performed. Material development efforts focused initially on reaction-bonded silicon nitride material. This approach was not successful, and the materials effort was refocused on the development of a permeable form of sintered silicon nitride (SSN). This effort was successful. The SSN material was used for the second phase of the program, filter manufacture and evaluation. Four half-scale SAN filter modules were fabricated. Three of the modules were qualified for filter performance tests. Tests were performed on two of the three qualified modules in the High-Temperature, High-Pressure facility at the Westinghouse Science and Technology Center. The first module failed on test when ft expanded into the clamping device, causing dust leakage through the filter. The second module performed well for a cumulative 150-hr test. It displayed excellent filtration capability during the test. The blowback pulse cleaning was highly effective, and the module apparently withstood the stresses induced by the periodic pulse cleaning. Testing of the module resumed, and when the flow of combustion gas through the filter was doubled, cracks developed and the test was concluded.

12055 (DOE/METC–93/6131, pp. 26) **Externalities: Impacts on IGCCs and PFBCs.** Grahame, T.J. (Deaprtment of Energy, Washington, DC (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Environmental costing, also referred to as environmental externalities, may have the potential to prevent the construction of any new coal facility, no matter how clean and efficient, in states which use particularly high externality figures. Because application of environmental costing is relatively new, externality values can vary be several orders of magnitude among states and can be derived using incompatible theories. In addition, a number of externality figures used to date have been shown to have an inadequate basis in science and/or economics. While some states may retain or adopt such figures, recent trends indicate an openness at the state regulatory level to a thoughtful understanding of the economics of externalities, both in establishing and using values, and in understanding their local impacts. Thus several states are now adopting the viewpoint that no externality value should apply to emissions that are required to be offset, or in several cases, are voluntarily offset. Other states now recognize that application of environmental externalities can have economic impacts which should be recognized. The extent to which these trends will continue is unclear, but the fact that they represent recent thinking is somewhat hopeful for the cleanest of new coal technologies, such as IGCCs and PFBCs. Several studies which attempt to measure the environmental impacts of various emissions are ongoing, with results due in the next two years. The air emission whose externality value will be of greatest importance to coal is carbon dioxide, but oxides of nitrogen and particulates are also important. Another important issue is whether states impose externality values on emissions from plants built to serve them in other localities.

12056 (DOE/METC–93/6131, pp. 55-70) **PCFB environmental performance and efficiency, the Pyropower perspective.** Dryden, R.J. (Pyropower Coproration, San Diego, CA (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of the DMEC-1 PCFB Repowering project is to demonstrate the use of Ahlstrom Pyroflow® Pressurized Circulating Fluidized Bed (PCFB) technology in a repowering application. The DMEC-1 Limited Partnership, with Midwest Power as the general partner and Dairyland Power as a limited partner, is planning to repower the mothballed Des Moines Power Station. The station has been renamed as the Des Moines Energy Center. The project will be partially funded by the Department of Energy under round 3 of the Clean Coal Technology program and as is expected to demonstrate substantial reductions in emission of SO_2 and NO_x relative to that of the previous plant while simultaneously improving plant heat rate and increasing power output.

12057 (DOE/METC–93/6131, pp. 71-81) **Specific filter designs for PFBC.** Bruck, G.J. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Newby, R.A.; Smeltzer, E.E. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-86MC21023 ; FC21-89MC26042. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Pressurized Fluidized Bed Combustion (PFBC) technologies (bubbling bed, circulating bed, second generation) are currently being developed and demonstrated for commercial scale application. Hot gas particulate filters are key components for the successful application of PFBC in power generation gas turbine cycles. The objective of this work is to develop practical hot gas filter designs that meet the performance and operational requirements of PFBC. The design basis for the filter is verified by operating filter test units in subpilot and pilot scale facilities. Key features of the commercial design are incorporated into the test modules.

12058 (DOE/METC–93/6131, pp. 82-85) **Particulate characterization for PFBC filter systems.** Pontius, D.H. (Southern Research Institute, Birmingham, AL (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-90MC25140. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Southern Research Institute is participating, as a subcontractor to Southern Company Services (SCS), in METC's project to establish a Power Systems Development Facility at Wilsonville, Alabama. This plant will serve as a facility for the development and testing of advanced systems for coal-based power generation. An important part of the program will be to test and evaluate various kinds of particulate control devices and systems for operation at high temperatures and high pressures. The hot gas cleanup technology is a critical factor in achieving the highest levels of energy efficiency in the advanced power systems. In connection with evaluation of particulate control devices to be installed at this facility, SRI has the responsibility for developing methods and equipment of characterize the particulate material suspended in the hot gas streams. Our objectives are to design systems for sampling and monitoring particulate mass loadings and size distributions at appropriate locations in the plant and to develop methods for operating these systems. We will assist SCS in the preparation of test plans for the operation of the plant, and we will participate in carrying out the particulate measurements.

12059 (DOE/METC–93/6131, pp. 103-120) **Land application uses of pressurized fluidized-bed combustion (PFBC) ash.** Dick, W.A. (Ohio State Univ., Columbus, OH (United States)); Wolfe, W. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-91MC28060. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Dry alkaline flue gas desulfurization by-products (dry lime and limestone FGD scrubber ashes) including the American Electric Power (AEP) Tidd PFBC bed and cyclone ash, are being evaluated for beneficial uses via land application for agriculture, mine reclamation, and soil stabilization in a 5 year study that began December, 1990. A 1989 Battelle Memorial Institute report had recommended that the highest priority in stimulating reuse of FGD by-products was the sponsoring of in-field research of coal combustion products generated from high sulfur midwestern coals to (a) better understand and quantify the leach rate, fate and transport of sulfates and trace metals and (b) demonstrate the level of protection necessary to build public acceptance of land-based reuses.

12060 (DOE/METC–93/6131, pp. 134-135) **General Electric hot gas cleanup and regeneration.** Gal, E. (GE Environmental Services, Inc., Lebanon, PA (United States)); Furman, A.H.; Ayala, R. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-87MC23170. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

GE Environmental Services, Inc. (GEESI) and its major subcontractors GE Corporate Research and Development (GE-CRD) and GE Power Generation (GEPG) have completed significant further pilot plant scale test operation of an integrated fixed bed gasification, hot gas cleanup and gas turbine simulation facility located at GE-CRD in Schenectady, NY. Progress during the past year has included first desulfurization and regeneration testing with zinc titanate, significant regeneration hardware and process modifications, continued test exposure of a full scale gas turbine fuel control valve, first long term integrated operation of the MS6000 based gas turbine simulator and off-line operation of a subscale, staged combustor system designed to minimize NO_x production from fuel bound nitrogen. Long Duration Tests 3, 3AR1, 3AR2 and 3A were conducted with zinc titanate sorbent and demonstrated the continued ability of the absorber to reduce inlet H_2S levels of 3500 ppmv to less than 30 ppmv provided properly regenerated sorbent was returned to the absorber. Tests 3AR1 and 3AR2 were limited duration, off line regeneration tests, utilizing residual sulfided material from Test 3, to evaluate continuing regeneration hardware, instrumentation and process modification. Test 3A was a fully integrated 100 hour test incorporating final regenerator modifications and resulted in first fully controlled regeneration. Anthracite coal was utilized for Test 3A as a means of partial elimination of halogens in the fuel gas prior to inclusion of a specific halogen removal process step envisioned for Long Duration Test 4. Further test operation will revert to use of Illinois bituminous coal with up to 3.4 percent sulfur and 0.1 to 0.28 percent chloride content in order to fully evaluate high sulfur regeneration operation as well as halogen removal.

12061 (DOE/METC–93/6131, pp. 136-145) **Testing of zinc titanate desulfurization sorbents for moving-bed applications.** Ayala, R.E. (GE Corporate Research and Development, Schenectady, NY (United States)); Gal, E.; Gupta, R.P. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-88MC25003. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of the option 3 program within the contract is to develop chemically reactive and mechanically durable zinc titanate sorbent formulations that are suitable for moving-bed, high-temperature, desulfurization of coal gas. Work on zinc ferrite formulations was performed under the base program (Ayala, 1991); work on zinc titanate formulations was initiated under the Option 2 program (Ayala, 1993); and is continued under the present Option 3 program.

12062 (DOE/METC–93/6131, pp. 146-157) **Enhanced durability of desulfurization sorbents for fluidized-bed applications.** Gupta, R.P. (Research Triangle Institute, Research Triangle Park, NC (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-88MC25006. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to identify and demonstrate methods for enhancing long-term chemical reactivity and attrition resistance of zinc ferrite and zinc titanate sorbents to be employed for desulfurization of hot coal-derived gases in a high-temperature, high-pressure (HTHP) fluidized-bed reactor. Specific objectives of this study are the following: (1) Investigating various manufacturing methods to produce zinc ferrite and zinc titanate sorbents in a particle size range of 50 to 400 μm; (2) Characterizing and screening the formulations for chemical reactivity, attrition resistance, and structural properties; (3) Testing selected formulations in an HTHP bench-scale fluidized-bed reactor to obtain an unbiased ranking of the promising sorbents; (4) Investigating the effect of various process variables, such as temperature, nature of coal gas, gas velocity, and chemical composition of the sorbent, on the performance of the sorbent; (5) 100-cycle testing of the superior zinc ferrite and zinc titanate formulations under HTHP conditions to determine their long-term chemical reactivity and mechanical strength; (6) Addressing various reactor design issues; (7) Generating a database on sorbent properties and performance (e.g., rates of reaction, attrition rate) to be used in the design and scaleup of future commercial hot-gas desulfurization systems. (8) Transferring sorbent manufacturing technology to the private sector; and (9) Producing a large batch of the sorbent to demonstrate commercial feasibility of the preparation method.

12063 (DOE/METC–93/6131, pp. 158-168) **LASH oxidation, waste management.** Katta, S. (M.W.Kellogg Company, Houston, TX (United States)); Henningsen, G. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-91MC27233. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to obtain experimental data on the reactions of calcium-based sorbents in coal gasification systems and to evaluate or develop kinetic models applicable to the commercial design of such systems. Both air-blown coal gasification systems and second generation fluid bed coal combustion systems (partial gasification) will be investigated, as well as subsequent stabilization of the solid wastes (calcium sulfide/ash) produced. More specifically, the objectives are to: study kinetics of oxidation of CaS to $CaSO_4$; develop and identify viable techniques to stabilize CaS; develop data on viable techniques to stabilize CaS; develop data on kinetics of in-situ desulfurization reactions; study the effect of calcium on the kinetics of carbon conversion rate; and carry out further development work on most promising method for stabilization of the solids and determine it commercial viability.

12064 (DOE/METC–93/6131, pp. 179-190) **Desulfurization of hot fuel gas with Z-Sorb III sorbent.** O'Donnell, J.J. (M.W.Kellogg Company, Houston, TX (United States)); Katta, S.; Grindley, T.; Delzer, G.; Khare, G. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to evaluate regenerable sorbents for potential use in desulfurization of integrated gasification combined cycle (IGCC) fuel gas in a fixed bed operating at temperatures of 900-1200°F (482-649°C) and pressures up to 300-400 psia (2068-2758 kPa). Important evaluation criteria are adequate sulfur absorption capacity, physical and chemical durability, and complete regenerability.

12065 (DOE/METC–93/6131, pp. 191-202) **Advanced hybrid gasification facility.** Sadowski, R.S. (CRS Sirrine Engineers, Inc., Greenville, SC (United States)); Skinner, W.H.; Johnson, S.A.; Dixit, V.B. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this procurement is to provide a test facility to support early commercialization of advanced fixed-bed coal gasification technology for electric power generation applications. The proprietary CRS Sirrine Engineers, Inc. PyGas™ staged gasifier has been selected as the initial gasifier to be developed under this program. The gasifier is expected to avoid agglomeration when used on caking coals. It is also being designed to crack tar vapors and ammonia, and to provide an environment in which volatilized alkali may react with aluminosilicates in the coal ash thereby minimizing their concentration in the hot raw coal gas passing through the system to the gas turbine.

12066 (DOE/METC–93/6131, pp. 205-210) **Hollow fiber catalytic membranes.** Ma, Y.H. (Worcester Polytechnic Institute, MA (United States)); Moser W.; Shelekhin, A.; Pien, S. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-89MC26372. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of the present research is to investigate the possibility of the enhancement of the H_2S thermal decomposition in the IGCC system by employing the hollow fiber catalytic membrane reactor. To accomplish the objective, the following major components in the analysis of the high temperature membrane reactor must be investigated: (1) high-temperature stability of the porous glass

membrane; (2) catalytic properties of MoS_2 and of the porous glass membrane; (3) catalytic decomposition of H_2S in a packed bed reactor; (4) catalytic decomposition of 100%, 8.6%, and 1.1% H_2S gas mixtures in the membrane reactor.

12067 (DOE/METC–93/6131, pp. 211-219) **Thermal/chemical degradation of inorganic membrane materials.** Krishnan, G.N. (SRI International, Menlo Park, CA (United States)); Sanjurjo, A.; Wood, B.J. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-92MC28053. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to evaluate the long-term thermal and chemical degradation of inorganic membranes that are being developed to separate gaseous products produced by the gasification or combustion of coal in fixed-, fluidized-, and entrained-bed gasifiers, direct coal-fired turbines, and pressurized-fluidized-bed combustors.

12068 (DOE/METC–93/6131, pp. 220-232) **Coal ash behavior in reducing environments.** Erickson, T.A. (Univ. of North Dakota, Grand Forks, ND (United States)); Brekke, D.W.; Folkedahl, B.C.; Tibbetts, J.E.; Nowok, J.W. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-86MC10637. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of the Coal Ash Behavior in Reducing Environments (CABRE) program is to advance the knowledge of ash behavior in coal gasification systems; this knowledge will help provide and understanding necessary to operate advanced coal utilization systems efficiently with a minimum of the operational problems associated with ash properties. The program approach is to use carefully controlled, laboratory-scale experiments coupled with detailed analysis of the materials involved to determine the critical fundamental mechanisms of ash behavior in coal gasification systems.

12069 (DOE/METC–93/6131, pp. 245-254) **A sorbent injection and filtration process for H_2S removal from hot gas.** Roberts, D.L. (CeraMem Corp., Waltham, MA (United States)); Abrams, R.F. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FG02-92ER81364. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This project was funded under the DOE SBIR program as a Phase I project in July, 1992, and has recently been continued into the Phase II development program. The primary objective of the Phase I program was to demonstrate technical feasibility of a duct injection process for removing H_2S from a hot coal gas, a process that consists of injecting finely-divided sorbent into the hot, sulfur-containing coal gas followed by removal of the spent sorbent in a compact ceramic filter. Specific technical objective of the Phase I program included demonstration of: (1) H_2S removal of 98% or greater with: (a) residence times of 3 seconds or less, (b) use of readily attainable sorbent particle sizes (e.g., 1 micron or greater), and (c) a sorbent/H_2S stoichiometric ratio of 1.5 or less; (2) Substantially complete removal efficiency (>99.9%) of spent sorbent by the ceramic filter; (3) Efficacy of both zinc titanate and copper chromite as sorbents at 750°C.

12070 (DOE/METC–93/6131, pp. 255-264) **Novel concept for an on-line alkali monitoring probe.** Sethi, V.K. (Western Research Institute, Laramie, WY (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-93MC30126. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The main objective of this project is to develop an on-line alkali monitor for use in advanced coal utilization technologies.

12071 (DOE/METC–93/6131, pp. 265-275) **High-temperature H_2S-removal processes using limestones.** Lynn, S. (Lawrence Berkeley Lab., CA (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This project is exploring the technical and economic feasibility of using a high-temperature process for cleaning coal gas prior to combustion in a gas turbine. Coal gas would pass through a nearly-isothermal, moving bed of calcium carbonate that would remove particulates (by filtration), hydrogen chloride and hydrogen sulfide (by chemisorption), and ammonia (by catalysis). The objective of this research is to define the temperature at which these goals can best be realized at a given pressure. Preliminary calculations indicate a probable range for this temperature of 650° to 900°C, about 100° to 500°C below the outlet temperatures of most gasifiers.

12072 (DOE/METC–93/6131, pp. 276-283) **On-line monitoring of mercury and hydrogen chloride in hot gases from coal gasifiers.** Norton, G.A. (Ames Lab., IA (United States)); Chriswell, C.D. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract W-7405-ENG-82. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to (1) summarize current technology for monitoring mercury (Hg) and hydrogen chloride (HCl) in gaseous effluents, (2) identify analytical techniques for such determinations in high-temperature, high-pressure gases from coal-based systems of interest to METC for producing electrical power, (3) formulate plans for developing suitable Hg and HCl analyzers, and (4) develop and test the instruments. The ultimate goal of this work is to produce reliable on-line monitors which are adaptable to plant-scale diagnostics and process control.

12073 (DOE/METC–93/6131, pp. 295-298) **Effects of operating conditions on dust cake behavior in filters with high surface-to-volume ratios.** Chiang, T.K. (Morgantown Energy Technology Center, WV (United States)); Dennis, R. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

One objective of the METC in-house particulate cleanup program is to develop and advance laboratory findings on high-temperature and high-pressure (HTHP) particulate filtration for commercial-scale demonstration of Clean Coal projects. Another objective is to develop (HTHP) particulate filtration for use in other Fossil Energy programs that require hot gas cleanup. The HTHP filtration technology developed in-house will be transferred to industry, and the in-house test facilities made available for cooperative research and development agreement (CRADA) projects.

12074 (DOE/METC–93/6131, pp. 299-301) **Pressurized burner test facility.** Maloney, D.J. (Morgantown Energy Technology Center, WV (United States)); Norton, T.S.; Hadley, M.A. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The Morgantown Energy Technology Center (METC) is currently fabricating a high-pressure burner test facility. The facility was designed to support the development of gas turbine combustion systems fired on natural gas and coal-derived gaseous fuels containing fuel-bound nitrogen. Upon completion of fabrication and shake-down testing in October 1993, the facility will be available for use by industrial and university partners through Cooperative Research and Development Agreements (CRADAs) or through other cooperative arrangements. This paper describes the burner test facility and associated operating parameter ranges and informs interested parties of the availability of the facility.

12075 (DOE/METC–93/6131, pp. 302-306) **Fluid-bed HGD PDU.** Bissett, L.A. (Morgantown Energy Technology Center, WV (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

METC is constructing an on-site, fluid-bed, hot-gas desulfurization (HGD) process development unit (PDU) to support the US Department of Energy's (DOE) Integrated Gasification Combined Cycle power systems program. Once operational, this PDU will be used to develop process scale-up and performance data for a number of configurations and to demonstrate fully coupled sulfidation-regeneration operations. Its size and gas throughput should also enable the PDU to address some of the actual engineering design and control issues associated with fluid-bed, HGD processes.

12076 (DOE/METC–93/6131, pp. 315-325) **Fixed-bed testing of a molybdenum-promoted zinc titanate sorbent for hot gas desulfurization.** Mei, J.S. (Morgantown Energy Technology Center, WV (United States)); Gasper-Galvin, L.; Everitt, C.E.; Katta, S. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to investigate the reactivity and durability of a molybdenum-promoted, zinc-titanate sorbent formulation for hydrogen sulfide removal from simulated coal gas mixtures under high-temperature and high-pressure conditions in a fixed-bed reactor.

12077 (DOE/METC–93/6131, pp. 326-331) **METC fluid-bed test rigs/test program.** Walczak, S.C. (Morgantown Energy Technology Center, WV (United States)); Rockey, J.M.; Rutten, J. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Integrated Gasification Combined Cycle (IGCC) power generation systems have been proven to be clean and economical coal-based power generation systems. A critical subsystem of the IGCC process that can enhance overall power plant efficiency is hot particulate and sulfur removal prior to electricity generation. The Morgantown Energy Technology Center (METC) has an onsite integrated gasification/hot gas cleanup facility to assist in the development of hot particulate removal and desulfurization processes for IGCC systems.

12078 (DOE/METC–93/6131, pp. 335-344) **A calcium oxide sorbent process for bulk separation of carbon dioxide.** Harrison, D.P. (Louisiana State Univ., Baton Rouge, LA (United States)); Han, C.; Silaban, A. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-89MC26366. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This project is part of the DOE program investigating the separation of bulk components from coal-derived gases at moderate to high temperatures ($200 \leq T \leq 700°C$). Phase I investigated the separation of CO_2 using the reversible noncatalytic gas-solid reaction $CO_2(g) + CaO(s) \leftrightarrow CaCO_3(s)$. In Phase II we are studying the feasibility of combining CO_2 removal with the water-gas shift reaction $CO(g) + H_2O(g) \leftrightarrow CO_2(g) + H_2(g)$. The first reaction could be useful in increasing the heating value of coal-derived fuel gas or the separation of anode product gas from a molten carbonate fuel cell with recycle of H_2 and CO_2 to the appropriate electrodes. The combined reactions provide a possible route for the direct production of low-cost H_2 from coal-derived gas.

12079 (DOE/METC–93/6131, pp. 345-356) **Evaluation of options for CO_2 capture/utilization/disposal.** Doctor, R.D. (Argonne National Lab., IL (United States)); Livengood, C.D. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract W-31109-ENG-38. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The project objective is to develop engineering evaluations of technologies for the capture, use, and disposal of carbon dioxide (CO_2). This project emphasizes CO_2-capture technologies combined with integrated gasification combined-cycle (IGCC) power systems. Complementary evaluations will address CO_2 transportation, CO_2 use, and options for the long-term sequestration of unused CO_2. Commercially available CO_2-capture technology will provide performance and economic baselines for comparing innovative technologies. Limited experimental research will provide data to evaluate a new concept for CO_2-enhanced concrete. Table 1 summarizes FY 1993 activities. Results from this project are being shared with the technical community (Doctor, 1993). The intent of this research is to provide the CO_2 budget, or an "equivalent CO_2" budget associated with each of the individual energy-cycle steps, in addition to process design capital and operating costs. The value used for the "equivalent CO_2" budget is 1 kg CO_2/kWh$_e$. The base case is a 458-MW IGCC system using an air-blown Kellogg Rust Westinghouse (KRW) agglomerating fluidized bed gasifier, Illinois #6 bituminous coal feed, and in-bed sulfur removal. Three commercial CO_2 recovery technologies are under study: amine scrubbing, Selexol, and Rectisol. Three emerging CO_2 recovery technologies are also being evaluated: high-temperature CO_2 separation with calcium-or magnesium-based sorbents, high-temperature molten-carbonate membranes for acid-gas removal, and ambient-temperature facilitated-transport membranes for acid-gas separation.

12080 (DOE/METC–93/6131, pp. 357-358) **Transport reactor demonstration unit.** Ness, R.O. Jr. (Univ. of North Dakota, Grand Forks, ND (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-90MC25140. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The University of North Dakota Energy & Environmental Research Center (EERC), under a subcontract with Southern Companies Services, Inc., is installing a transport reactor demonstration unit (TRDU), designed and fabricated by the M.W. Kellogg Company. The system is being constructed to obtain scalable hydrodynamic and integrated data for the design of the transport reactor that is proposed for the hot-gas cleanup facility in Wilsonville, Alabama. The TRDU design specifically addresses the two-stage gasification/adiabatic/dense-phase mixing concepts, as well as providing scalable hydrodynamics. The project is divided into three major tasks: (1) Design, procurement, and installation of the TRDU, support utilities, and piping (2) Relocation of an existing hot-gas cleanup loop (3) Parametric testing of a bituminous and subbituminous coals. The TRDU design is based on a coal feed rate of nominally 200 lb/hr at a pressure of 135 psig and temperature of 870°-1090°C (1600°-2000°F).

12081 (DOE/METC–93/6131, pp. 359-369) **IGCC database and hot gas cleanup systems studies.** Chen, H.T. (Gilbert/Commonwealth, Inc., Reading, PA (United States)); Klett, M.G.; Rutkowski, M.D.; Zaharchuk, R. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC01-88FE61660 ; AC01-88FE61662. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

In view of the worldwide coal gasification activity as new technologies become commercial and new installations are designed and built, the DOE feels that there is a need for a concise knowledge source that summarizes information on planned and existing gasification facilities. Gilbert/Commonwealth, Inc. has been directed to develop the coal gasification database with the objective of establishing a comprehensive information resource on coal gasification for the DOE. It is a compilation of information/data on the significant power-producing gasification projects being planned, constructed, or operating, as well as those which produce both synthesis gas and end products. The coal-fired integrated gasification combined cycle (IGCC) power plant using hot gas cleanup has the potential for being an attractive low-cost means of producing electrical power for baseload utilities, as well as modular repowering of conventional coal-based steam power plants. To achieve the lowered costs associated with high temperature operation, the DOE Gas Stream Cleanup Program is conducting R&D on high temperature, high pressure contaminant control processes which include particulate control, raw gas desulfurization and sorbent regeneration concepts, and the recovery of sulfur in the form of elemental sulfur or sulfuric acid. The program activities are described.

12082 (DOE/METC–93/6131, pp. 383-395) **Development of an electrochemical hydrogen separator.** Abens, S. (Energy Research Corp., Danbury, CT (United States)); Fruchtman, J.; Kush, A. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-89MC26040. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to develop an electrochemical hydrogen separation device for cost-effective hydrogen recovery from various dilute hydrogen streams. Potential applications include high purity hydrogen recovery from oxygen and air blown gasifiers, as well as hydrogen-lean streams such as a carbonate fuel cell anode exhaust. In the present program, the effect of design and operating parameters (e.g. pressure, temperature, and H_2 recovery) on EHS performance have been characterized in single subscale cells (25 cm^2 active area) and presented as a mathematical model. Full size (1050 cm^2), multi-cell module operation has also be demonstrated. Process conceptual design and economics for a potential application have been evaluated for the EHS and a competing technology.

12083 (DOE/METC–93/6131, pp. 399-410) **NH_3/H_2S advances.** Gupta, R.P. (Research Triangle Institute, Research Triangle Park, NC (United States)); Krishnan, G.N.; Hung, S.L. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-92MC29011. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this study is to develop a combined sorbent-catalyst material containing mixed-metal oxide sorbents to remove H_2S to <20 ppmv and stable NH_3 decomposition catalysts capable of achieving 90 percent or greater NH_3 decomposition.

12084 (DOE/METC–93/6131, pp. 411-423) **High temperature hydrogen sulfide removal with tin oxide.** Copeland, R.J. (TDA Research, Inc., Wheat Ridge, CO (United States)); Feinberg, D.; Wickham, D.; Windecker, B.; Yu, J. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FG03-90ER80998. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

This Phase II SBIR contract is developing a sorbent and process which removes H_2S from hot gasified coal and generates sulfur during regeneration of the sorbent. The process can be used with any type of reactor (e.g., fixed or moving bed) and any gasifier (e.g., KRW or Texaco) and shows lower costs that competing H_2S removal processes. TDA Research's (TDA) process uses a regenerable stannic oxide-based (SnO_2) sorbent as the first sorbent and zinc ferrite (or zinc titanate) as a second sorbent to remove H_2S to very low concentrations. The process converts the sulfides from both sorbents to elemental sulfur, a commercial product which is easy to store and transport. The object of this phase is to develop chemically active, high sulfur loadings, and durable stannic oxide sorbents and to demonstrate the process at the bench scale.

12085 (DOE/METC–93/6131, pp. 424-431) **DSRP, direct sulfur production.** McMichael, W.J. (Research Triangle Institute, Research Triangle Park, NC (United States)); Agarwal, S.K.; Jang, B.L.; Howe, G.B.; Chen, D.H.; Hopper, J.R. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-90MC27224. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this work is to demonstrate on a bench-scale the Direct Sulfur Recovery Process (DSRP) for up to 99 percent or higher recovery of sulfur (as elemental sulfur) from regeneration off-gases and coal-gas produced in integrated gasification combined cycle (IGCC) power generating systems. Fundamental kinetic and thermodynamic studies will also be conducted to enable development of a model to predict DSRP performance in large-scale reactors and to shed light on the mechanism of DSRP reactions. The ultimate goal of the project is to advance the DSRP technology to the point where industry is willing to support its further development.

12086 (DOE/METC–93/6131, pp. 432-444) **Hot coal gas desulfurization with manganese-based sorbents.** Hepworth, M.T. (Univ. of Minnesota, Minneapolis, MN (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-92MC29246. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The focus of work being performed on Hot Coal Gas Desulfurization is primarily in the use of zinc ferrite and zinc titanate sorbents; however, prior studies at the U.S. Steel Fundamental Research Laboratories in Monroeville, PA, by E.T. Turkdogan indicated that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt% ore + 25 wt% Al_2O_3) may be a viable alternative to zinc-based sorbents. Manganese, for example, has a lower vapor pressure in the elemental state than zinc hence it is not as likely to undergo depletion for the sorbent surface upon loading and regeneration cycles. Also manganese oxide is less readily reduced to the elemental state than iron hence the range of reduction potentials for oxygen is somewhat greater than for zinc ferrite. In addition, thermodynamic analysis of the manganese-oxygen-sulfur system shows it to be less amenable to sulfation than zinc ferrite. Potential also exists for utilization of manganese higher temperatures than zinc ferrite or zinc titanate. This presentation give the thermodynamic background for consideration of manganese-based sorbents as an alternative to zinc ferrite. To date the work which has been in progress for nine months is limited at this stage to thermogravimetric testing of four formulations of manganese-alumina sorbents to determine the optimum conditions of pelletization and induration to produce reactive pellets.

12087 (DOE/METC–93/6131, pp. 445-459) **Trace element emissions.** Erickson, T.A. (Univ. of North Dakota, Grand Forks, ND (United States)); Steadman, E.N.; Zygarlicke, C.J.; Hauserman, W.B.; Hassett, D.J. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-92MC28016. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The Energy & Environmental Research Center (EERC) is carrying out an investigation that will provide methods to predict the fate of selected trace elements in integrated gasification combined cycle (IGCC) and integrated gasification fuel cell (IGFC) systems to aid in the development of methods to control the emission of trace elements determined to be air toxics. The goal of this project is to identify the effects of critical chemical and physical transformations associated with trace element behavior in IGCC and IGFC systems. The trace elements included in this project are arsenic, chromium, cadmium, mercury, nickel, selenium, and lead. The research seeks to identify and fill, experimentally and/or theoretically, data gaps that currently exist on the fate and composition of trace elements. The specific objective are to (1) review the existing literature to identify the type and quantity of trace elements from coal gasification systems, (2) perform laboratory-scale experimentation and computer modeling to enable prediction of trace element emissions, and (3) identify methods to control trace element emissions.

12088 (DOE/METC–93/6131, pp. 460-469) **Applications of moving granular-bed filters to advanced systems.** Haas, J.C. (Combustion Power Company, Menlo Park, CA (United States)); Eshelman, M.B. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-90MC27423. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Efforts to design and operate coal-fired gas turbines plants in advanced gasification and combustion power cycles have been intensified in recent years. These efforts, such as those carried out by Combustion Power Company in the early 1970's, have been plagued by turbine problems due to ash-ladened combustion gases. It is generally recognized that a hot gas cleanup train must be used before the gas turbine to remove the major portion of the particulate. Advantages are also evident for a filter system that can remove other coal derived contaminants such as sulfur and alkali. With most particulate and other contaminants removed, erosion

and corrosion of turbine materials, as well as deposition of particles within the turbine, are reduced to acceptable levels.

12089 (DOE/METC–93/6131, pp. 470-478) **Integrated low emissions cleanup system for multi-contaminant control.** Alvin, M.A. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Bachovchin, D.M.; Smeltzer, E.E. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-87MC24257. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The Westinghouse Electric Corporation, Science & Technology Center (W-STC) is developing an Integrated Low Emissions Cleanup (ILEC) concept for high-temperature gas cleaning to meet environmental standards, as well as to provide economical gas turbine life. The ILEC concept can simultaneously control particulate, sulfur, alkali, and other contaminants in high-pressure fuel gases, or combustion gases, at temperatures up to about 1700°F in advanced, coal-fired, power generation systems. The objective of this program is to demonstrate, at a bench scale, the conceptual, technical feasibility of the ILEC concept for multi-contaminant control, and to provide test data applicable to the design of subsequent field tests.

12090 (DOE/METC–93/6131, pp. 479-480) **Particle collection enhancement by acoustics.** Mansour, M.N. (Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)); Chandran, R.R.; Duqum, J.N.; Scaroni, A.W.; Koopman, G.H.; Loth, J.L. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-89MC26288. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to demonstrate pulse combustion induced acoustic enhancement of coal ash agglomeration and sulfur capture efficiency at conditions typical of proposed direct coal-fired turbines. The MTCI proprietary approach results in agglomerates that allow the use of conventional cyclones to achieve very high particulate collection efficiency and eliminates the need for barrier filters which pose concerns regarding durability and economics. The goal of the program is to support the mission of the Department of Energy (DOE) for developing coal-fired combustion gas turbines. The MTCI concept can be packaged either as a hot flue gas clean-up subsystem for the existing combustor island configurations or as an alternative primary pulse combustor island with integrated sulfur capture, particulate agglomeration and capture, alkali gettering and NO_x emissions control.

12091 (DOE/METC–93/6131, pp. 483-496) **Initial operation of the Tidd PFBC hot gas clean up filter.** Hoffman, J.D. (Ohio Power Company, Columbus, OH (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FC21-89MC26042. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to evaluate the design and obtain operating experience for up to two Advanced Particle Filter (APF) systems through long-term testing on a slipstream at Ohio Power Company's Tidd PFBC Demonstration Plant. Performance and reliability of commercial-scale filter modules will be monitored to aid in an assessment of the readiness and economic viability of this technology for commercial PFBC applications.

12092 (DOE/METC–93/6131, pp. 497-512) **Westinghouse filter update.** Bruck, G.J. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Smeltzer, E.E.; Newby, R.A.; Bachovchin, D.M. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-86MC21023 ; AC21-88MC24021 ; FC21-89MC26042. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The Department of Energy, Morgantown Energy Technology Center (DOE/METC), with Westinghouse are developing high temperature particulate filters for application in integrated, coal gasification combined cycle (IGCC) and pressurized fluidized bed combustion (PFBC) power generation systems. Development of these IGCC and PFBC advanced power cycles using subpilot and pilot scale facilities include the integrated operation of a high temperature particulate filter. This testing provides the basis for evaluating filter design, performance and operation characteristics in the actual process gas environment. This operating data is essential for the specification of components and materials and successful scaleup of the filter systems for demonstration and commercial application.

12093 (DOE/METC–93/6131, pp. 513-514) **Ceramic filter material issues.** Sawyer, J.W. (Acurex Environmental Corp., Mountian View, CA (United States)); Brown, J.J.; Brown, N.R. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-88MC25203. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The development of advanced power production processes such as pressurized fluid bed combustion (PFBC) or integrated gasification combined cycle (IGCC) is important to assure the energy future of the United States. These power producing processes can potentially produce electric power at competitive prices in an environmentally benign manner. The use of high temperature filters is required in these processes to assure high operating efficiency. However, high temperature filters have not proven to be durable in these applications. The objective of the effort is to identify and investigate the filter material degradation mechanisms. The filter materials examined under this project are silicon carbide based ceramic candle filters from two manufactures: Schumacher and Refractron. Specifically, the Schumacher Diaschumalith F40 and the Refractron 70/3 with 442-T binder were subjected to a series of tests which examined their ability to withstand thermal fatigue and chemical corrosion from steam and alkali. Both these candles are composed to silicon carbide grains in an alumina/silica based binder. There are differences in binder formulation between the two candles and each manufacturer has a different approach to forming the filtration membrane on the candle surface.

12094 (DOE/METC–93/6131, pp. 515-538) **Evaluation of ceramic filter material, selection for application.** Alvin, M.A. (Westinghouse Electric Corp., Pittsburgh, PA (United States)); Lippert, T.E.; Diaz, E.S.; Tressler, R.E. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract AC21-88MC25034. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The objectives of this program are to identify the potential long-term thermal/chemical effects that advanced coal-based power generating systems have on the stability of porous ceramic filter materials, as well as to assess the influence of these effects on filter operating performance and life.

12095 (DOE/METC–93/6131, pp. 539-540) **Ceramic filters for removal of particles from hot gas streams.** Abrams, R.F. (CeraMem Corp., Waltham, MA (United States)); Paquette, P.; Roberts, D.L. USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. DOE Contract FG02-90ER80896. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The goal of this Phase II SBIR program is demonstration of the performance of a novel ceramic membrane-coated monolith filter for removing particles from hot gas streams from advanced coal conversion processes. The filter construction is based on a multiple-passageway porous ceramic monolith that has passageways coated with a ceramic membrane and alternate, adjacent monolith passageways plugged to form a dead-ended filter. During filtration, dirty gas enters passageways open at the inlet end face of the filter and particulate matter is trapped within the inlet passageways. The filtered gas passes through the internal walls of the filter and exits from outlet passageways at the opposing end face of the monolith. Filter regeneration is performed periodically by backpulsing. Prototype filters of this type with up to five square feet of filter area were fabricated and tested successfully in the Phase I program. The primary objectives of the Phase II program are development of full-scale ceramic filters, demonstration of full-scale

filters in field trials, and full-scale system design and costing. The first year of the program was devoted primarily to selection and evaluation of materials for making filter elements, development of procedures to fabricate full-size ceramic filters (37 ft^2 of filtration area), and evaluation of possible sites for extended field tests of prototype filter systems. Thermal shock and thermal cycling tests in the laboratory were performed to demonstrate acceptable thermal durability of all filter materials, including the monolith support, its ceramic membrane coating, and the monolith passageway plugging cement. In addition, procedures were developed for fabricating full-scale filters, and several full-scale filters have been produced.

12096 (DOE/METC–93/6131, pp. 541-555) **Some ceramic options.** Zievers, J.F. (Industrial Filter & Pump Mfg. Co., Cicero, IL (United States)); Eggerstedt, P.M.; Aguilar, P.C.; Zievers, E.C. US-DOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

Ceramic candle filters have proven to be an effective means of removing particulates to levels exceeding New Source Performance Standards (NSPS) in high temperature applications. The traditional "hard" ceramic filter elements, typically formed form granules however, have shown to be susceptible to failure from physical shock, thermal stress, and chemical attack. Additionally, these hard, dense candles can be costly and present internal filter design problems due to their relatively high weight. A good deal has been written about to use to porous ceramics in the filtration of high temperature gases for removal of particulate matter. Unlike the dense, granular ceramic filter elements, vacuum formed chopped ceramic fiber (VFCF) filters represent an attractive alternative. Composed of commercially available chopped ceramic fibers and utilizing existing vacuum forming technology, low cost filter elements with excellent physical and thermal shock resistance are now available. The ceramic fiber filter "skeleton" can be "post-treated" with refractory materials to enhance strength and chemical resistance, as well as to change permeability to suit a particular application. Also, because the ceramic fiber skeleton has greater porosity and is composed of low density materials, the final product is significantly lighter in weight than the traditional dense ceramic elements, making overall filter design an easier task. The use of ceramics extends beyond that of filter elements, however. Ceramics in the form of refractory have long been used to protect metal structures from high temperature and abrasion, and an extensive body of literature deals with this subject.

12097 (DOE/METC–93/6132, pp. 137-138) **Ultra-low gas turbine emissions using catalytic and noncatalytic porous combustors.** Dibble, R.W.; Chen, Juh-Yuan; Sawyer, R.F. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The goal of our work is to explore ultra-low (one ppm NO_x) emission gas turbine concepts which sustain the high efficiency of the combustion process already achieved by the gas turbine industry. We propose to focus on one promising but poorly understood concept, combustors with catalytic or noncatalytic surfaces. Our research will employ experiment and computational modeling to develop an improved understanding of combustion with strong surface interactions under conditions appropriate to gas turbines. Models will guide experimental design and data interpretation; experimental results will guide model development. We anticipate that the model will provide a tool for extrapolation from laboratory to design thereby providing gas turbine manufacturers with a means to make intelligent decisions on the applicability of catalytic and non-catalytic combustion. The concept of catalytic combustors which employ catalytic surfaces in high porosity matrices has been demonstrated; the use of noncatalytic porous materials to stabilize flames has received less attention. Such concepts allow the combustion of low calorific value fuels, or very lean mixtures, or low temperature combustion through radiant heat transfer and can result in very low NO_x. The stabilization of combustion at conditions ordinarily beyond the lean (or dilute) flammability limit is promoted by catalytic and/or preheating processes. The possibilities are new and under-explored. The mechanisms are poorly understood and describing models not well-developed.

12098 (DOE/METC–93/6132, pp. 334-344) **Sub-scale development of an acoustically enhanced cyclone for PFBC.** Galica, M.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Acoustically enhanced cyclone collectors offer the potential of achieving environmental particulate control standards under pressurized fluidized bed combustion conditions without the need for post turbine particulate control. The objective of this research program is to extend acoustic agglomeration technology from the laboratory scale up to the sub-pilot scale. The effects of high intensity sound on the agglomeration of fly ash particles are being investigated in a simulated PFCB effluent stream. The test facility consists of a variable residence time acoustic agglomeration chamber with a vitiating air preheat combustor, an ash injection system utilizing an auger feeder, a natural gas fired pulse combustor sound source, and a two-stage high temperature, high temperature, high pressure cyclone. Fly ash for these tests has been obtained from the TVA Shawnee Station circulating fluidized bed combustor, as well as the Nucla CFBC, and Tidd AEP. Low frequency acoustic agglomeration tests are underway. The acoustically enhanced cyclone collector is being evaluated with two distinct goals in mind: (1) determine the effects of the major operating parameters on acoustic agglomeration efficiency, and (2) optimize the agglomeration system performance for maximum particulate removal efficiency. The data obtained during these tests will provide direction information on the effects of sound intensity and frequency, particle residence time, ash loading, and pressure on the enhancement of cyclone collection efficiency with acoustic agglomeration. These data, in conjunction with results from an acoustic agglomeration computer model will be used to evaluate the economic and engineering feasibility of an acoustically enhanced cyclone collector for a full scale pressurized fludized bed combustor.

12099 (DOE/METC–93/6132, pp. 383-385) **The DOE NEPA Process.** Van Ooteghem, S.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The National Environmental Policy Act (NEPA) declares that Federal agencies shall have a general commitment to "use all practicable means" to conduct their activities in a way that will promote "the general welfare where man and nature can exist in productive harmony." Within these general guidelines, the manner in which NEPA requirements are implemented may be somewhat different and unique from one Federal agency to the next. A brief overview indicating the types of NEPA documents that are produced by the DOE in compliance with NEPA is given. The level of NEPA documentation required for any given project is graded and dependent on the project's size, complexity, and potential consequences to health and the human environment. More complex projects with potentially greater environmental impacts require a much more in-depth analysis to ensure that these potential consequences can be managed and/or mitigated, so that the proposed project can proceed in compliance with NEPA.

12100 (DOE/PC/92534–6) **Selective catalytic reduction of sulfur dioxide to elemental sulfur: Quarterly technical progress report No. 6, October–December 1993.** Liu, W.; Flytzani-Stephanopoulos, M.; Sarofim, A.F. Massachusetts Inst. of Tech., Cambridge, MA (United States). [1993]. 18p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract FG22-92PC92534. Order Number DE94008321. Source: OSTI; NTIS; GPO Dep.

Elemental sulfur recovery from SO_2-containing gas stream is highly attractive as it produces a salable product and no waste to dispose of. However, commercially available schemes are complex and involve multi-stage reactors, such as, most notably in the Resox (reduction of SO_2 with coke) and Claus plant (reaction of SO_2 with H_2S over catalyst). This project will investigate a cerium oxide catalyst for the single stage selective reduction of SO_2 to elemental sulfur by a reductant, such as carbon monoxide. Cerium oxide has been identified in recent work at MIT as a superior catalyst for SO_2 reduction by CO to elemental sulfur because its high activity and high selectivity to sulfur over COS over a wide temperature range (400–650°C). The detailed kinetic and parametric studies of SO_2 reduction planned in this work over various CeO_2 formulations will provide the necessary basis for development of a very simplified process, namely that of a single-stage elemental sulfur recovery scheme from variable concentration gas streams. The potential cost- and energy-efficiency benefits from this approach can not be overstated. A first apparent application is treatment of a regenerator off-gases in power plants using regenerative flue gas desulfurization. Such a simple catalytic converter may offer the long-sought "Claus-alternative" for coal-fired power plant applications.

12101 (DOE/PC/92535–T5) **Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: Fifth quarterly project status report, 1 October 1993–30 December 1993.** Levendis, Y.A.; Wise, D.L. Northeastern Univ., Boston, MA (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92535. Order Number DE94008329. Source: OSTI; NTIS; GPO Dep.

In this study the effectiveness of calcium magnesium acetate (CMA, $CaMg_2(CH_2COOH)_6$) as an SO_2 sorbent in pulverized coal combustion was assessed. Experiments were conducted in a laboratory-scale laminar flow furnace at temperatures (550–1250°C) and gas concentrations (1500–2000 ppM SO_2, 2–3% O_2) relevant to post-flame in-boiler sorbent injection systems. Tests were conducted at molar Ca/S ratios of 1 and 2 with dry injected particles that were about 75–90 microns in size. The residence time was varied from 2 to 4 seconds. SO_2 removal efficiencies of 80% and above were measured at a Ca/S ratio of 2 at temperatures between 750 and 950°C; efficiencies of 40–50% were measured at a Ca/S ratio of 1 over the same temperature distribution. The data was compared with a sulfation model that predicted SO_2 removal efficiencies. For a Ca/S ratio of 2, the model predicted the same maximum SO_2 removal efficiencies as those measured (exceeding 80% over a 200°C temperature span) but at temperatures that were 200°C higher (between 950–1150 °C); for a Ca/S ratio of 1, the model predicted removal efficiencies that were about 10% higher than those measured and occurred at temperatures about 200°C higher. Also, the increase and decay of the calculated SO_2 absorption efficiency rose and fell more steeply with temperature than the measured efficiency; these discrepancies between the data and the model suggest that reactions besides CaO sulfation are important contributors to the measured reduction in SO_2.

12102 (DOE/PC/92548–T5) **Suppression of fine ash formation in pulverized coal flames: Quarterly technical progress report No. 5, October 1, 1993–December 31, 1993.** Kramlich, J.C.; Hoffman, D.A.; Butcher, E.K. Washington Univ., Seattle, WA (United States). Dept. of Mechanical Engineering. 31 Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92548. Order Number DE94008331. Source: OSTI; NTIS; GPO Dep.

Laboratory work and studies of full-scale coal-fired boilers have identified two general mechanisms for ash production. The vast majority of the ash is formed from mineral matter that coalesces as the char burns, yielding particles that are normally larger than 0.5μm. Flagen and Friedlander proposed a simple model for this residual ash, called the breakup model. The second major mechanism is the generation of a submicron aerosol through a vaporization/condensation mechanism. When the ash size distribution is plotted in terms of number density, the submicron mode generally peaks at about 0.1 μ/m. When plotted in terms of mass, this mode is sometimes distinct from the residual ash mode, [13] and sometimes merged into it. Although these particles represent a relatively small fraction of the mass, they can present a large fraction of the surface area. Thus, they are a preferred site for the condensation of the more volatile oxides later in the furnace. This leads to a layering effect in which the refractory oxides are concentrated at the particle core and the more volatile oxides reside at the surface. This also explains the enrichment of the aerosol by volatile oxides that has been noted in samples from practical furnaces. These volatile metal oxides include the majority of the toxic metal contaminants, e.g., mercury, arsenic, selenium and nickel. Risk assessment studies suggest that toxic metal emissions represent a significant portion of the health risk associated with combustion.

12103 (DOE/PC/93214–T1) **Separation of flue-gas scrubber sludge into marketable products: First quarterly technical progress report, 1 September, 1993–30 November, 1993.** Kawatra, S.K.; Eisele, T.C.; Shoop, K. Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering. Dec 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93214. Order Number DE94008086. Source: OSTI; NTIS; GPO Dep.

To reduce their sulfur emissions, many coal-fired electric power plants use wet flue-gas scrubbers. These scrubbers convert sulfur oxides into solid sulfate and sulfite sludge, which must then be disposed of. The vast majority of the sludge is simply landfilled, but with increasing landfilling costs this can cost the plant millions of dollars per year. Producing marketable materials from the sludge is a far more promising avenue, provided that the products can meet the necessary specifications at a reasonable cost. This project is investigating the surface properties of scrubber sludge, particularly of the calcium sulfite, since the surface chemistry of this material has never been studied in detail. Knowledge of these properties is critical for the development of a process that can produce a high-quality calcium sulfite or gypsum product while keeping process costs low enough that the material produced will be competitive with that from other, more conventional sources. This purification will consist of minimal-reagent froth flotation, using the surface properties of the particles of unreacted limestone to remove them and their associated impurities from the material, leaving a purified gypsum or calcium sulfite product. The separated limestone will be a useful by-product, as it can be recycled to the scrubber, thus boosting the limestone utilization and improving process efficiency. Calcium sulfite will then be oxidized to gypsum, or separated as a salable product in its own right from sludges where it is present in sufficient quantity. The main product of the process will be either gypsum or calcium sulfite, depending on the characteristics of the sludge being processed. These products will be sufficiently pure to be easily marketed, rather than being landfilled.

2004 Health and Safety

Refer also to citation(s) 12288

12104 (ISTISAN–92-38) **Fly ash: Chemical-physical and mineralogical characterization.** Paoletti, L. (Istituto Superiore di Sanita, Rome (Italy). Lab. di Ultrastrutture); Diociaiuti, M.; Ziemacki, G.; Viviano, G.; Gianfagna, A. No corporate text available. 1992. 88p. (In Italian). Order Number DE94752634. Source: OSTI; NTIS (US Sales Only).

Fly ash from fossil fuel power plants, municipal waste incinerators and refuse fueled boilers is now being utilized as road construction material. With the aim of facilitating health risk assessments of this practice by providing a sound basis for thorough toxicological examinations, this paper reports on a study in which the crystalline and amorphous constituents of fly ash, according to type of combustion plant and fuel, were identified and analyzed by the use of various analytical techniques which included: scanning electron microscopy, transmission electron microscopy, X-ray diffraction, and absorption, X-ray, and energy loss spectroscopy.

2005 Environmental Aspects

Refer also to citation(s) 11981, 12042, 12043, 12044, 12045, 12046, 12047, 12048, 12049, 12050, 12051, 12288, 13039, 13078, 13131

12105 (DOE/EIS–0194-Summ.) **Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Summary.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1994. 21p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2283). Order Number DE94007588. Source: OSTI; NTIS; GPO Dep.

BPA is considering whether to purchase electrical power from a proposed privately-owned combustion-turbine electrical generation plant in Washington. The plant would be fired by natural gas and would use combined-cycle technology to generate 240 average megawatts (aMW) of energy. The plant would be developed, owned, and operated by Tenaska Washington Partners II, L.P. The project would be located about 19 kilometers (12 miles) southeast of downtown Tacoma in the Frederickson Industrial Area, Pierce County. The proposed plant would occupy about half of a 6.4-hectare (16-acre) parcel and would be consistent with the industrial character of its surroundings. The proposed site is currently undeveloped and zoned for industrial use by the county. Main environmental concerns identified in the scoping process and in comments on the Draft Environmental Impact Statement (EIS) include: (1) potential air quality impacts, such as emissions and their contribution to the "greenhouse" effect; (2) potential health and safety impacts, such as nuisance odors, plant safety, visibility and heat-emission systems which may affect low-flying planes and potential health effects of electric and magnetic fields; and (3) potential water quality and quantity impacts, such as the amount of wastewater to be discharged, the source and amount of water required for plant operation. These and other issues are discussed in detail in the EIS. The proposed project already includes many features designed to reduce environmental impacts. Based on investigations performed for the EIS, no significant unavoidable adverse environmental impacts associated with the proposed project were identified, and no evidence emerged to suggest that the proposed action is controversial. The EIS is being mailed to numerous agencies, groups, and individuals (see Section 8.0). There will be a 30-day no-action period before any decisions are made and the Record of Decision is signed.

12106 (DOE/EIS–0194-Vol.1) **Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Volume 1: Environmental analysis and technical appendices.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1994. 314p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2284). Order Number DE94007595. Source: OSTI; NTIS; GPO Dep.

BPA is considering whether to purchase electrical power from a proposed privately-owned combustion-turbine electrical generation plant in Washington. The plant would be fired by natural gas and would use combined-cycle technology to generate 240 average megawatts (aMW) of energy. The plant would be developed, owned, and operated by Tenaska Washington Partners II, L.P. The project would be located about 19 kilometers (12 miles) southeast of downtown Tacoma in the Frederickson Industrial Area, Pierce County. The proposed plant would occupy about half of a 6.4-hectare (16-acre) parcel and would be consistent with the industrial character of its surroundings. The proposed site is currently undeveloped and zoned for industrial use by the county. Main environmental concerns identified in the scoping process and in comments on the Draft Environmental Impact Statement (EIS) include: (1) potential air quality impacts, such as emissions and their contribution to the "greenhouse" effect; (2) potential health and safety impacts, such as nuisance odors, plant safety, visibility and heat-emission systems which may affect low-flying planes and potential health effects of electric and magnetic fields; and (3) potential water quality and quantity impacts, such as the amount of wastewater to be discharged, the source and amount of water required for plant operation. These and other issues are discussed in detail in the EIS. The proposed project already includes many features designed to reduce environmental impacts. Based on investigations performed for the EIS, no significant unavoidable adverse environmental impacts associated with the proposed project were identified, and no evidence emerged to suggest that the proposed action is controversial. The EIS is being mailed to numerous agencies, groups, and individuals (see Section 8.0). There will be a 30-day no-action period before any decisions are made and the Record of Decision is signed.

12107 (DOE/METC–93/6131, pp. 332-334) **The DOE NEPA process.** Van Ooteghem, S.A. (Morgantown Energy Technology Center, WV (United States)). USDOE Morgantown Energy Technology Center, WV (United States). Jun 1993. In *Proceedings of the coal-fired power systems 93: Advances in IGCC and PFBC review meeting.* 786p. Order Number DE93000289. Source: OSTI; NTIS; GPO Dep.

The National Environmental Policy Act (NEPA) declares that Federal agencies shall have a general commitment to "use all practicable means" to conduct their activities in a way that will promote "the general welfare where man and nature can exist in productive harmony." Within these general guidelines, the manner in which NEPA requirements are implemented may be somewhat different and unique from one Federal agency to the next. A brief overview indicating the types of NEPA documents that are produced by the Department of Energy (DOE) in compliance with NEPA is shown in the figure. This figure indicates that the level of NEPA documentation required for any given project is graded and dependent on that project's size, complexity, and potential consequences to health and the human environment. More complex projects with potentially greater environmental impacts require a much more in-depth analysis to ensure that these potential consequences can be managed and/or mitigated, so that the proposed project can proceed in compliance with NEPA.

2006 Economic, Industrial, and Business Aspects

Refer also to citation(s) 12339

2007 Legislation and Regulations

Refer also to citation(s) 13078

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

Refer also to citation(s) 12164, 12165, 12166, 12182, 12263, 12267, 12276, 12710, 14281, 14282

12108 (IAEA-SM–332, pp. 16-17) **Advanced reactor design objectives - A European utility perspective.** Board, J.A.; Berbey, P.; Valero, E. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

A European utility perspective in advanced reactor development is discussed in this paper.

12109 (IAEA-SM–332, pp. 18-20) **Design and safety objectives of advanced nuclear power systems in Asia.** Chatterjee, S.K.; He, J.; Kakodkar, A.; Kang, C.S.; Masuda, F. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society

(KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The approaches toward developing advanced nuclear power systems in asia are described.

12110 (IAEA-SM-332, pp. 21-22) **Eastern European advanced reactor design objectives.** Fedorov, V.G.; Afrov, A.M.; Kralovec, J. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The history of nuclear power plants development in Eastern and Central Europe is described. Objectives of advanced reactor design development are outlined.

12111 (IAEA-SM-332, pp. 25-26) **Principles underlying nuclear plant safety.** Kouts, H.J.C. (Defense Nuclear Facilities Safety Board, Washington, DC (United States)). International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Principles underlying nuclear power plant safety, other than specified in INSAG-3 and INSAG-4 documents, are described.

12112 (IAEA-SM-332, pp. 27-28) **Beyond the next generation of plants.** Rosen, M. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety). International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The IAEA activities on the development of safety principles for the design of future nuclear power plants are outlined.

12113 (IAEA-SM-332, pp. 36-37) **Incentives to strengthen international co-operation in R and D for advanced nuclear power technology.** Balthesen, E. (Forschungszentrum Juelich GmbH (Germany)); Bakunyaev, A.D.; Gibson, I.H.; Hosemann, J.P.; Tavoni, R.; Versteegh, A.M. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

This paper is concerned with the need for International Cooperation in R and D for Advanced Reactors in order to maintain options for the future deployment of nuclear power against the current background of declining R and D capability in Europe.

12114 (IAEA-SM-332, pp. 38-39) **Regulatory co-operation for future nuclear power plants between France, Germany and United Kingdom.** Lacoste, A.C.; Hohlefelder, W.; Harbison, S. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028--: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The activities of two working groups in the field of regulatory cooperation for future nuclear power plants between France, Germany and United Kingdom are described.

12115 (IAEA-TECDOC-724) **Probabilistic safety assessment for seismic events.** International Atomic Energy Agency, Vienna (Austria). Oct 1993. 51p. Order Number DE94616280. Source: OSTI; NTIS (US Sales Only); INIS.

This Technical Document on Probabilistic Safety Assessment for Seismic Events is mainly associated with the Safety Practice on Treatment of External Hazards in PSA and discusses in detail one specific external hazard, i.e. earthquakes.

12116 (IAEA-TECDOC-729) **Risk based optimization of technical specifications for operation of nuclear power plants.** International Atomic Energy Agency, Vienna (Austria). Dec 1993. 145p. Order Number DE94616281. Source: OSTI; NTIS (US Sales Only); INIS.

The objective of the report is to present an overview of the risk and reliability based approaches (using a probabilistic safety assessment (PSA)) for improving nuclear power plant technical specifications (TS). In that case, it will provide an information base to the Member States in seeking PSA based applications to enhance the effectiveness of their technical specifications. To achieve this objective, the report discusses the basic objectives and reasons for seeking TS changes, the methods, data requirements and uses of different types of applications, and an overview of different applications that have been completed, including detailed descriptions of selected applications. Refs, figs and tabs.

12117 (INIS-RU-372) **Problems of nuclear science and technology: Scientific-technical collection.** Fizika yadernykh reaktorov, no.1. Fizika i metody rascheta yadernykh reaktorov. Gagarinskij, A.Yu. (ed.). Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1992. 96p. (In Russian). Order Number DE94616109. Source: OSTI; NTIS (US Sales Only); INIS.

The computer programs for calculations of parameters for power reactor cores of different types are described. The problems of the

program varification and estimation of the efficiency of the mathematical models applied are considered. Brief descriptions of the programs for calculation of radiation shields for nuclear-engineering plants are given.

12118 (JAERI-M–92-207, pp. 12-21) **Nuclear technology and materials science.** Olander, D.R. (California Univ., Berkeley, CA (United States). Dept. of Nuclear Engineering). Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1992. (CONF-9202184–: 4. international symposium on advanced nuclear energy research, Mito (Japan), 5-7 Feb 1992; JAERI-CONF–1). In *Proceedings of the fourth international symposium on advanced nuclear energy research: Roles and direction of material science in nuclear technology.* 676p. Order Number DE93508339. Source: OSTI; NTIS; INIS.

Current and expected problems in the materials of nuclear technology are reviewed. In the fuel elements of LWRs, cladding waterside corrosion, secondary hydriding and pellet-cladding interaction may be significant impediments to extended burnup. In the fuel, fission gas release remains a key issue. Materials issues in the structural alloys of the primary system include stress-corrosion cracking of steel, corrosion of steam generator tubing and pressurized thermal shock of the reactor vessel. Prediction of core behavior in severe accidents requires basic data and models for fuel liquefaction, aerosol formation, fission product transport and core-concrete interaction. Materials questions in nuclear waste management and fusion technology are briefly reviewed. (author).

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Refer also to citation(s) 11637, 12128, 12258, 12273

12119 (ETDE-IT–94-13) **Confirmatory tests of full-scale condensers for SBWR.** Masoni, P. (ENEA, Bologna (Italy)); Botti, S.; Fitzsimmons, G.W. No corporate text available. 1993. 10p. (CONF-930352–21: 2. Japan Society of Mechanical Engineers (JSME)/American Society of Mechanical Engineers (ASME) joint international conference on nuclear engineering, San Francisco, CA (United States), 21-24 Mar 1993). Order Number DE94752514. Source: OSTI; NTIS (US Sales Only).

A full-scale isolation condenser and a full-scale passive containment cooling condenser for the Simplified Boiling Water Reactor (SBWR) will be tested to confirm the thermal-hydraulic and structural design characteristics of these components. The condensers provide vital roles in removing heat from the reactor vessel and the containment during certain design basis events. This paper describes the condensers and the test facilities which are under construction and summarizes the test objectives, the planned instrumentation, and the conditions to be tested. The results of some pre-test performance predictions, calculated with the TRACG code are presented. The results of the testing program are expected to demonstrate that the condenser designs will provide the required heat removal capacity and will survive the design basis temperature/pressure cycles without structural damage.

12120 (JAERI-M–93-016, pp. 112-124) **Development of PIE techniques in NFD.** Hayashi, Y. (Nippon Nuclear Fuel Development Co. Ltd., Oarai, Ibaraki (Japan)); Koizumi, S.; Sakaguchi, N. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Nippon Nuclear Fuel Development Co., Ltd.(NFD), a subsidiary of Toshiba and Hitachi, was established in 1972 to research and develop BWR fuels, BWR structural materials and FBR fuels. NFD's hot laboratory started operation in 1977. Since then, PIEs have been carried out on nineteen BWR fuel bundles, including a failed bundle and two MOX bundles. In addition, many test fuel samples and material specimens, irradiated in test reactors or commercial BWRs, have been examined. Various PIE techniques have been developed and improved throughout these examinations. This paper presents the PIE techniques developed by NFD related to the recent R and D of BWR fuels. (author).

12121 (JAERI-M–93-016, pp. 145-158) **Development of thermal property measuring apparatus for high burnup fuel.** Nishino, Y. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Owada, I.; Kushida, T.; Yamahara, T. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Extended burnup is one of the important concerns for the advanced LWR technology, and it has been needed to confirm the fuel integrity and to collect fuel performance data. In this contexts, new PIE techniques and apparatus have been developed at the Reactor Fuel Examination Facility (RFEF) in order to study high burnup fuel behavior such as fission gas release, waterside corrosion, pellet cladding interaction and thermal property. This paper describes the apparatus and techniques used to determine the thermal conductivity and melting temperature in high burnup fuels. (author).

12122 (JAERI-M–93-016, pp. 185-196) **Re-instrumentation technique of pressure gauge for irradiated fuel rod.** Shimizu, M. (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Oshima, K.; Ishii, T.; Kawamura, H.; Ando, H.; Oyamada, R. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The extention of the burnup of LWR fuel from an economical point of view is one of the current important issues. In order to study irradiation behavior of high burnup LWR fuel, re-instrumentation to LWR fuel irradiated in LWRs of fission product (FP) gas pressure gauge and thermocouple for center temperature measurement are being developed in the Department of JMTR Project. The re-instrumentation of fission product gas pressure gauge has been developed since 1985, and put into actual use currently through successful demonstration test done in 1990 using power ramping testing facility the BOCA (BOiling water CApsule). The fuel rod used for the demonstration test was a segment (length of 412mm) fuel rod irradiated up to about 25GWd/t in a BWR. The pressure gauge was attached to an end plug of the fuel rod by TIG welding. After that a perforation with diameter of about 1.5 mm was made on the end plug by electric arc discharge to lead the gas pressure from the inside of the fuel rod to the pressure gauge without gas leakage. In the demonstration test, electrical characteristics of the instrumentation such as resistance, insulation resistance and reluctance of coil of the differential transformer as well as out put of the pressure gauge corresponding to linear heat rate of the fuel rod were checked. (author).

12123 (JAERI-M–93-016, pp. 197-208) **Thermocouple re-instrumentation technique for irradiated fuel rod.** Ishii, T. (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Ito, H.; Saito, J.; Kawamura, H.; Shimizu, M.; Oyamada, R.; Ando, H. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The information on FP gas pressure and centerline temperature of fuel pellets during power transient are important to study the FP gas release behavior of high burnup LWR fuel rods. At the JMTR Project, a re-instrumentation technique of FP gas pressure gage for an irradiated fuel rod was developed in 1990. And a thermocouple re-instrumentation technique has been developing since 1988. Two steps are taken to carry out the development program. In the first step, a drilling technique was developed for making a center hole of the irradiated fuel pellets. Various drilling tests were carried out using dummys of fuel rods consisted of Zry-2 cladding and Ba_2FeO_3 pellets. On this work, it is important to keep the pellets just the state cracked at a power reactor. In these tests, the technique to fix the pellets by frozen CO_2 was used during the drilling

work. And diamond drills were used to make the center hole. These tests were completed successfully. A center hole, 54 mm depth and 2.5 mm diameter, was realized by this method. The second step of this program is an in-pile demonstration test on an irradiated fuel rod instrumented dually a thermocouple and a FP gas pressure gage. The design of a dual instrumentation device has been completed. The demonstration test will be carried out at the JMTR in 1994. (author).

12124 (JAERI-M–93-157) **Conceptual study of the future nuclear fuel cycle system for the extended LWR age.** Fujine, Sachio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Takano, Hideki; Sato, Osamu; Tone, Tatsuzo; Yamada, Takashi; Kurosawa, Katsutoshi. Japan Atomic Energy Research Inst., Tokyo (Japan). Aug 1993. 88p. (In Japanese). Order Number DE94748538. Source: OSTI; NTIS; INIS.

A large scale integrated fuel cycle facility (IFCF) is assumed for the future nuclear fuel cycle in the extended LWR age. Spent MOX fuels are reprocessed mixed with UOX in a centralized reprocessing plant. The reprocessing plant separates long-lived nuclides as well as Pu. Nitric acid solutions of those products are fed directly to MOX fabrication process which is incorporated with reprocessing. MOX pellets are made by sphere-cal process. Two process concepts are made as advanced reprocessing incorporated with partitioning (ARP) which has the function of long-lived nuclides recovery. One is a simplified Purex combined with partitioning. Extractable long-lived nuclides, ^{237}Np and ^{99}Tc, are assumed to be recovered in main flow stream of the improved Purex process. The other process concept is made aiming at recovering all TRU nuclides in reprocessing to meet with TRU recycle requirement in the long future. A concept of the future fuel cycle system is made by combining integrated fuel cycle facility and very high burnup LWRs (VHBR). The reactor concept of VHBRs has been proposed to improve Pu recycle economy in the future. Highly enriched MOX fuel are loaded in the full core of reactor in order to increase reactivity for the burnup. Fuel cycle indices such as Pu isotopic composition change, spent fuel integration, nuclide transmutation effect are estimated by simulating the Pu recycling in the system of VHBR and ARP. It is concluded that Pu enrichment of MOX fuel can be kept less than 20 % through multi-recycle. Reprocessing MOX fuels with UOX shows a favorable effect for keeping Pu reactivity high enough for VHBR. Integration of spent MOX fuel can be reduced by Pu recycle. Transmutation of Np is feasible by containing Np into MOX fuel. (author).

12125 (NEI-SE–141) **Loss of collected particles from the filter of the stack monitor, the Ringhals-1 power reactor.** Stroem, L. (Instrumentinvest, Nykoeping (Sweden)). Swedish Radiation Protection Inst., Stockholm (Sweden). 26 May 1993. 13p. (In Swedish). Project SSI-P–693-92-1. Order Number DE94616303. Source: OSTI; NTIS; INIS.

The function of the filter holder was examined in the laboratory and in the Ringhals measurement installation. It was concluded that a loss of sample could occur, if the filter has a heavy particle deposit. An approximate relation between deposits thickness and loss of sample could be determined. Particle concentration in the stack air is sometimes so high, that loss of sample can occur. The test have also revealed that the sample air stream can by-pass the filter, without proper indication of the defect. Control instrumentation is proposed.

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Refer also to citation(s) 11637, 12121, 12122, 12123, 12124, 12183, 12184, 12254, 12258, 12262, 12270, 12271, 12273, 12277, 12725, 12771

12126 (ANL/ET/CP–80141) **Irradiation-assisted stress corrosion cracking of materials from commercial BWRs: Role of grain-boundary microchemistry.** Chung, H.M.; Ruther, W.E.; Sanecki, J.E.; Hins, A.G.; Kassner, T.F. Argonne National Lab., IL (United States). Dec 1993. 18p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931079–17: Water reactor safety information meeting, Bethesda, MD (United States), 25-27 Oct 1993). Order Number DE94006542. Source: OSTI; NTIS; INIS; GPO Dep.

Constant-extension-rate tensile tests and grain-boundary analysis by Auger electron spectroscopy which were conducted on high- and commercial-purity (HP and CP) Type 304 stainless steel (SS) specimens from irradiated boiling-water reactor (BWR) components to determine susceptibility to irradiation-assisted stress corrosion cracking (IASCC) and to identify the mechanisms of intergranular failure. The susceptibility of HP neutron absorber tubes to intergranular stress corrosion cracking (IGSCC) was higher than that of CP absorber tubes or CP control blade sheath. Contrary to previous beliefs, susceptibility to intergranular fracture could not be correlated with radiation-induced segregation of impurities such as Si, P, C, N, or S, but a correlation was obtained with grain-boundary Cr concentration, indicating a role for Cr depletion that promotes IASCC. Detailed analysis of grain-boundary chemistry was conducted on neutron absorber tubes that were fabricated from two similar heats of HP Type 304 SS of virtually identical bulk chemical composition but exhibiting a significant difference in susceptibility to IGSCC for similar fluence. Grain-boundary concentrations of Cr, Ni, Si, P, S, and C in the crack-resistant and susceptible HP heats were virtually identical. However, grain boundaries of the cracking-resistant material contained less N and more B and Li (transmutation product from B) than those of the crack-susceptible material, indicating beneficial effects of low N and high B contents.

12127 (EDF–93-NB-00088) **Flow-induced decentering and tube support interaction for steam generator tubes: experiment and physical interpretation.** Gay, N.; Granger, S. Electricite de France (EDF), 92 - Clamart (France). Nov 1992. 37p. Order Number DE94613809. Source: OSTI; NTIS (US Sales Only); INIS.

Maintaining PWR components under reliable operating conditions requires a complex design to prevent damage from flow-induced vibration, wear, etc. To improve prediction of tube/support interaction and wear in PWR components, EDF has undertaken experimental and computational studies. This paper illustrates one aspect of this program, related to contact forces between steam generator tubes and anti-vibration bars (AVBs). The dynamic, non-linear behavior of a U-tube excited by air cross-flow is investigated on the CLAVECIN experiment. Interesting, rather unexpected results have been obtained, by varying clearances and flow velocities. Paper is focused on: (i) originality of experiment with a force measurement device located in flow; (ii) importance of a refined data processing for accurately measuring contact forces; (iii) presentation of unexpected phenomena revealed in CLAVECIN experiment, i.e. a flow-induced decentering of the tube which changed the initial tube/AVB clearance, and consequences on tube/support interaction; (iv) influence of actual tube/support clearance in flow on wear mechanisms. The work, presented in second part of this paper, concentrates exclusively on physical interpretation of flow-induced decentering phenomenon and theoretical analysis of its consequences on dynamic tube/support interaction. We show that the flow-induced decentering phenomenon can be generated by an unstable quasi-static coupling between the flexible tube and the confined flow, in the vicinity of the support system. This phenomenon is not specific to the CLAVECIN tests and it can be expected every time that a movable obstacle is subjected to confined flow. Moreover, in single-sided impacting conditions, the theoretical analysis confirms the linear relation, found in the CLAVECIN tests, between the mean impact force and the static lift force associated with (Abstract Truncated).

12128 (IAEA-SM–332, pp. 14-15) **Safety, technical, and economic objectives of EPRI's advanced light water reactor program.** Taylor, J.J.; Santucci, J. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems:

design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

EPRI's programme on advanced light water reactor development is outlined in this paper.

12129 (INIS-JP–018, pp. 426) **Shippingport reactor pressure vessel and neutron shield tank assembly probabilistic waterborne accident assessment.** Becker, D.L. (Westinghouse Hanford Co., Richland, WA (United States)); Burgess, D.M.; Lindquist, M.R. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Short communication. WASTE TRANSPORTATION/reactor decommissioning; WASTE TRANSPORTATION/safety; SHIPPINGPORT REACTOR; PRESSURE VESSELS; TANKS; CONCRETES; RIVERS; SAFETY; PROBABILISTIC ESTIMATION; LOW-LEVEL RADIOACTIVE WASTES; USES

12130 (INIS-mf–14149) **Gemeinschaftskernkraftwerk Grohnde. Annual report 1992.** Dittrich, W. Gemeinschaftskernkraftwerk Grohnde GmbH, Emmerthal (Germany). 22 Feb 1993. 88p. (In German). Order Number DE94747246. Source: OSTI; NTIS (US Sales Only); INIS.

Events and experience in 1992 are presented for Grohnde nuclear power station. The following subjects are mentioned: Operation, machinery, electrical engineering, physics/chemistry. The final section is dedicated to training. (UA)

12131 (INIS-RU–374, pp. 37-47) **Program for experimental investigation of fuel element and assembly behaviour in water cooled and moderated power reactors under transient and accidental operational conditions.** Grachev, A.F.; Kuprienko, V.A.; Makhin, V.M.; Smirnov, V.P.; Spiridonov, Yu.G.; Tsykanov, V.A.; Shulimov, V.N. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Nauchno-Issledovatel'skij i Konstruktorskij Inst. Ehnergotekhniki, Moscow (Russian Federation). 1992. 70p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94619627. Source: OSTI; NTIS (US Sales Only); INIS.

The program of in-pile tests and post-irradiation examination of the WWER fuel element serviceability is discussed. The methodological and engineering bases for tests in the SM-2, MIR, RBT reactors are described. As the results of the test program development the list and requirements for the conditions of experiment realization are determined. The problems dealing with additional equipment for experimental basis necessary for the first-order tests connected with the WWER reactor core safety verification are refined. 7 refs., 1 tab.

12132 (JAERI-M–93-016, pp. 1-15) **Present status and future plans of post irradiation examination for PWR NPP fuel assembly and materials in China.** Ding Yaping (Shanghai Nuclear Engineering Reseaech and Design Inst., SH (China)); Song Wenhui. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

This paper describes the irradiation tests of the fuel assembly and the reactor materials and their post irradiation examination for Qinshan Pressurized Water Reactor Nuclear Power Plant, the first one in China. The irradiation tests were performed in the Heavy Water Research Reactor and the High Flux Engineering Test Reactor respectively. And the PIE were performed in two corresponding Hot Laboratories attached to both Reactors. The purpose and equipment of various hot cells are illustrated in detail to clearly display their capability to carry out PIE. The PIE results of a mock test fuel assembly showed that the structure of the test assembly was integrated and all its performances were well below the limits specified by design criteria of fuel assembly after irradiation. The involved irradiation reactor materials were low alloy steel S-271 for the reactor pressure vessel and borosilicate glass tube for the burnable poison, etc.. Finally the future plans of PIE work for PWR NPP in China are briefly described. (author).

12133 (JAERI-M–93-016, pp. 107-111) **R and D program of PIE techniques at KAERI.** Ro, Seung-Gy (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of). Safety and Examination Analysis Div.). Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

R and D program has been conducted with the post-irradiation examination facility at Korea Atomic Energy Research Institute, which has been put into normal operation in 1987. The facility which is limited to several nondestructive and optical microscopic examinations in its functions has essentially bound a scope of the R and D program. However, a great effort has been made to maximize a utilization of the available facility and to develop post-irradiation examination techniques of nuclear fuels. It is believed that the R and D program undertaken makes it possible to provide adequate support services of the post-irradiation examination for PWR fuels, steam generator tube, control rod from nuclear power reactor, etc. (author).

12134 (JAERI-M–93-016, pp. 159-167) **Ion chromatographic separation of U, Pu and Nd for burnup measurement of irradiated nuclear fuel.** Joe, Kih-Soo (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Kim, Jung-Suk; Jeon, Young-Shin; Han, Sun-Ho; Eom, Tae-Yoon. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Ion chromatographic method has been applied for burnup measurement of nuclear fuel by dynamic system using 1-octanesulfonate as a cation exchanger and α-hydroxyisobutyric acid as an eluant. A number of elution techniques were evaluated for the optimum separation of plutonium, uranium and neodymium. These elements were individually separated and collected by gradient elution between 0.05 M and 0.40 M of α-hydroxyisobutyric acid in a single column, and finally determined by isotope dilution mass spectrometry. The burnup data from this method were compared with those from conventional anion exchange method. The results showed a good agreement within 3.5 % of relative standard deviation between two methods. (author).

12135 (JAERI-M–93-016, pp. 168-177) **Cooling time measurement of spent nuclear fuel by detection of activity ratio 144Ce/137Cs.** Lee, Young-Gil (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of). Div. of Safety and Examination Analysis); Eom, Sung-Ho; Ro, Seung-Gy. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Activity ratio of two radioactive fission products which had sufficiently different half-lives was expressed as a function of irradiation history and cooling time. The gamma-ray spectra of 36 samples from 6 spent PWR fuel assemblies were obtained by a spectrometric system equipped with a high purity germanium detector. Activity ratio $^{144}Ce/^{137}Cs$, analyzed from each spectrum, was used for calculation of cooling time. The measured cooling time by detection of activity ratio $^{144}Ce/^{137}Cs$ agreed well with the operator declared cooling time within $\pm$ 5 % despite the low counting rate of the gamma-ray of ^{144}Ce (about 10^{-3} count per second). For the samples with several different irradiation histories, the measured cooling time by modeled irradiation history showed good agreement with that by known irradiation history within $\pm$ 0.5 year. From these results, the detection of activity ratio $^{144}Ce/^{137}Cs$ by the gamma-ray spectrometry was considered as a useful method to

estimate the cooling time of spent fuels for the purpose of safeguards and management of spent nuclear materials. (author).

12136 (JAERI-M–93-016, pp. 178-184) **Development of underwater PWR irradiated fuel inspection equipment.** Chun, Y.B. (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Kim, E.K.; Ro, S.G. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Underwater equipment for the inspection of the nuclear fuel assemblies irradiated in a pressurized water reactor has been developed. The equipment has the capabilities of performing visual inspection and dimensional measurement of the irradiated fuel assembly as well as measuring the thickness of the oxide layer formed on the peripheral fuel rods of the fuel assembly. Hold-down spring force measuring device and several probe sensors to be attached to the inspection equipment were fabricated. The equipment was used successfully during the refueling outage of the Kori Unit-2 nuclear power plant. (author).

12137 (JAERI-M–93-016, pp. 241-247) **Analysis of in-reactor behavior of fuel rods irradiated in a PWR.** Koo, Yang-Hyun (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Song, Kun-Woo; Sohn, Dong-Seong; Ro, Seung-Gy. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The in-reactor behavior of fuel rods irradiated in Kori Unit 1 has been evaluated with the aid of fuel performance analysis code. Based on measured results of fuel density, a new correlation of in-reactor densification has been developed. Stack length changes predicted from the densification and swelling are less than the measured values, probably due to the development of cracks in pellet. Fission gas release predictions are found to be conservative. While maximum clad creep-down is reasonably predicted in the low burnups, it is overpredicted in the burnup range where PCI is considered to have occurred. Fuel rod growth increases with fast neutron fluence except four data points which experienced relatively higher clad temperature. (author).

12138 (JAERI-M–93-016, pp. 248-258) **Fission gas release from PWR fuel rods under condition of normal operation.** Min, D.K. (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Kim, K.S.; You, G.S.; Kim, S.J.; Kim, S.S. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Measurements of fission gas release have been performed for fourteen fuel rods which were irradiated during one to four cycles at the Kori Unit-1 nuclear power plant (PWR) in Korea. At low burnup less than about 33 GWD/MTU, the fractional fission gas releases (FFGRs) are found to be low (less than 0.5 %) and have a weak dependence on fuel rod burnup. However, at burnup higher than about 33 GWD/MTU FFGRs increase with burnup. The measured maximum value of FFGR is 1.2 % at the burnup of 36.25 GWD/MTU, which falls well below the fission gas release limit-fraction given by the NRC correlation. Fission gas release data are evaluated in relation to the characteristic micro-structural features and swelling behavior, and compared with the data from other PWRs. The results suggest that knockout and recoil mechanisms are dominantly operative for these PWR fuel rods under conditions of normal operation. (author).

12139 (JAERI-M–93-164) **Review and comparison of dominant core damage sequences in PWRs identified in NUREG-1150.** Watanabe, Norio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 164p. (In Japanese). Order Number DE94748540. Source: OSTI; NTIS; INIS.

Studies on accident management strategies need use of the research findings obtained from the recent PSAs and so on. In order to provide useful information for examining accident management strategies and carrying out experimental and analytical studies for preventing core damage, this report describes a review of the dominant core damage sequences identified for three PWR plant (Surry-1, Sequoyah-1, and Zion-1) in the latest PSA document, NUREG-1150. The dominant sequences which are common to two or three plants are also clarified through the comparison of the dominant sequences for each plant. An example of the former sequences is a station blackout with auxiliary feedwater available followed by battery depletion. As for the latter sequences, medium/small/very small-break LOCAs followed by failure of high pressure injection (HPI) are unique to Surry-1, very small-break LOCAs followed by failure of ECCS recirculation are to Sequoyah-1, and transients followed by reactor coolant pump seal LOCA and subsequent HPI failure are to Zion-1. These unique sequences are ascribed to the plant-specific designs and operating procedures as follows: the lower redundancy of HPI in Surry-1, the more complexity of manual switchover to ECCS recirculation in Sequoyah-1, the lower redundancy of component cooling water and/or service water systems and the larger number of safety-related equipment cooled by them in Zion-1. For the purpose of easily comparing dominant sequences identified for PWRs in future, generic event trees are constructed by using headings suitable for all three plants. These event trees are described in the appendix of this report. (J.P.N.).

12140 (JAERI-M–93-221) **Real-time graphic display system for ROSA-V Large Scale Test Facility.** Kondo, Masaya (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Anoda, Yoshinari; Osaki, Hideki; Kukita, Yutaka; Takigawa, Yoshio. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 139p. (In Japanese). Order Number DE94748660. Source: OSTI; NTIS; INIS.

A real-time graphic display system was developed for the ROSA-V Large Scale Test Facility (LSTF) experiments simulating accident management measures for prevention of severe core damage in pressurized water reactors (PWRs). The system works on an IBM workstation (Power Station RS/6000 model 560) and accommodates 512 channels out of about 2500 total measurements in the LSTF. It has three major functions: (a) displaying the coolant inventory distribution in the facility primary and secondary systems; (b) displaying the measured quantities at desired locations in the facility; and (c) displaying the time histories of measured quantities. The coolant inventory distribution is derived from differential pressure measurements along vertical sections and gamma-ray densitometer measurements for horizontal legs. The color display indicates liquid subcooling calculated from pressure and temperature at individual locations. (author).

12141 (NUREG/IA–0114) **Assessment of RELAP5/MOD3 with the LOFT L9-1/L3-3 experiment simulating an anticipated transient with multiple failures.** Bang, Y.S. (Korea Inst. of Nuclear Safety, Taejon (Korea, Republic of)); Seul, K.W.; Kim, H.J. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Korea Inst. of Nuclear Safety, Taejon (Korea, Republic of). Feb 1994. 107p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Prepared as part of the Agreement on Research Participation and Technical Exchange under the International Thermal-Hydraulic Code Assessment and Application Program (ICAP).

The RELAP5/MOD3 5m5 code is assessed using the L9-1/L3-3 test carried out in the LOFT facility, a 1/60-scaled experimental reactor, simulating a loss of feedwater accident with multiple failures and the sequentially-induced small break loss-of-coolant accident. The code predictability is evaluated for the four separated subperiods with respect to the system response; initial heatup phase, spray and power operated relief valve (PORV) cycling phase, blowdown phase and recovery phase. Based on the comparisons of the results from the calculation with the experiment data, it is shown that the overall thermal-hydraulic behavior important to the scenario such as a heat removal between the primary side and the secondary side and a system depressurization can be well-predicted and that the code could be applied to the full-scale

nuclear power plant for an anticipated transient with multiple failures within a reasonable accuracy. The minor discrepancies between the prediction and the experiment are identified in reactor scram time, post-scram behavior in the initial heatup phase, excessive heatup rate in the cycling phase, insufficient energy convected out the PORV under the hot leg stratified condition in the saturated blowdown phase and void distribution in secondary side in the recovery phase. This may come from the code uncertainties in predicting the spray mass flow rate, the associated condensation in pressurizer and junction fluid density under stratified condition.

12142 (SAND–92-7308) **Performance of Sequoyah Containment Anchorage System.** Fanous, F. (Iowa State Univ. of Science and Technology, Ames, IA (United States). Inst. for Physical Research and Technology); Greimann, L.; Wassef, W.; Bluhm, D. Sandia National Labs., Albuquerque, NM (United States); Ames Lab., IA (United States). Jan 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (IS–5012). Order Number DE94005313. Source: OSTI; NTIS; INIS; GPO Dep.

Deformation of a steel containment anchorage system during a severe accident may result in a leakage path at the containment boundaries. Current design criteria are based on either ductile or brittle failure modes of headed bolts that do not account for factors such as cracking of the containment basemat or deformation of the anchor bolt that may affect the behavior of the containment anchorage system. The purpose of this study was to investigate the performance of a typical ice condenser containment's anchorage system. This was accomplished by analyzing the Sequoyah Containment Anchorage System. Based on a strength of materials approach and assuming that the anchor bolts are resisting the uplift caused by the internal pressure, one can estimate that the failure of the anchor bolts would occur at a containment pressure of 79 psig. To verify these results and to calibrate the strength of materials equation, the Sequoyah containment anchorage system was analyzed with the ABAQUS program using a three-dimensional, finite-element model. The model included portions of the steel containment building, shield building, anchor bolt assembly, reinforced concrete mat and soil foundation material.

2103 Power Reactors, Nonbreeding, Graphite Moderated

Refer also to citation(s) 12156, 12234, 12236, 12255, 12256, 12257, 12259, 12269, 12612

12143 (DOE-GT-MHR–100002) **Evaluation of the Gas Turbine Modular Helium Reactor.** Gas-Cooled Reactor Associates, San Diego, CA (United States). Feb 1994. 346p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-90SF18758. Order Number DE94007069. Source: OSTI; NTIS; INIS; GPO Dep.

Recent advances in gas-turbine and heat exchanger technology have enhanced the potential for a Modular Helium Reactor (MHR) incorporating a direct gas turbine (Brayton) cycle for power conversion. The resulting Gas Turbine Modular Helium Reactor (GT-MHR) power plant combines the high temperature capabilities of the MHR with the efficiency and reliability of modern gas turbines. While the passive safety features of the steam cycle MHR (SC-MHR) are retained, generation efficiencies are projected to be in the range of 48% and steam power conversion systems, with their attendant complexities, are eliminated. Power costs are projected to be reduced by about 20%, relative to the SC-MHR or coal. This report documents the second, and final, phase of a two-part evaluation that concluded with a unanimous recommendation that the direct cycle (DC) variant of the GT-MHR be established as the commercial objective of the US Gas-Cooled Reactor Program. This recommendation has been endorsed by industrial and utility participants and accepted by the US Department of Energy (DOE). The Phase II effort, documented herein, concluded that the DC GT-MHR offers substantial technical and economic advantages over both the IDC and SC systems. Both the DC and IDC were found to offer safety advantages, relative to the SC, due to elimination of the potential for water ingress during power operations. This is the dominant consequence event for the SC. The IDC was judged to require somewhat less development than the direct cycle, while the SC, which has the greatest technology base, incurs the least development cost and risk. While the technical and licensing requirements for the DC were more demanding, they were judged to be incremental and feasible. Moreover, the DC offers significant performance and cost improvements over the other two concepts. Overall, the latter were found to justify the additional development needs.

12144 (IAEA-TECDOC–722) **Safety assessment of design solutions and proposed improvements to Smolensk Unit 3 RBMK nuclear power plant: Report of the IAEA extrabudgetary programme on the safety of RBMK nuclear power plants.** International Atomic Energy Agency, Vienna (Austria). Oct 1993. 284p. Order Number DE94616330. Source: OSTI; NTIS (US Sales Only); INIS.

The present document details the findings and recommendations of an assessment of measures to enhance the safety of the Smolensk Unit 3 RBMK reactor. 74 figs, 19 tabs.

12145 (INIS-GB–605) **Statement of nuclear incidents at nuclear installations.** Health and Safety Executive, London (United Kingdom). Nuclear Installations Inspectorate. 5 Jan 1994. 5p. Order Number DE94621296. Source: OSTI; NTIS (US Sales Only); INIS.

Five incidents are reported. At Torness reactor, three out of the four valves isolating the ByPass Gas Plant from the reactor did not close automatically as required. At Wylfa reactor, a component of the reactor fuel equipment fell into the reactor core. Also at Wylfa, 138 GBq of Sulphur-35 gas were discharged into the atmosphere in breach of the weekly limit allowed. At Rolls-Royce, Derby, an uncontrolled exothermic reaction dissolving uranium/zirconium alloy swarf led to a small fire and a secondary fire. At Amersham International, a high activity radiography source was mistakenly withdrawn part way out of a transport container causing radiation alarm bells to be activated. In none of these incidents was there a significant release of radioactivity to the environment or individuals. However, in each case an investigation and review of procedures was required to ensure similar incidents do not occur. (UK).

12146 (ORNL/TM–12698) **Applications of Monte Carlo methods for the analysis of MHTGR case of the VHTRC benchmark.** Difilippo, F.C. Oak Ridge National Lab., TN (United States). Mar 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008493. Source: OSTI; NTIS; INIS; GPO Dep.

Monte Carlo methods, as implemented in the MCNP code, have been used to analyze the neutronics characteristics of benchmarks related to Modular High Temperature Gas-Cooled Reactors. The benchmarks are idealized versions of the Japanese (VHTRC) and Swiss (PROTEUS) facilities and an actual configuration of the PROTEUS Configuration 1 experiment. The purpose of the unit cell benchmarks is to compare multiplication constants, critical bucklings, migration lengths, reaction rates and spectral indices. The purpose of the full reactors benchmarks is to compare multiplication constants, reaction rates, spectral indices, neutron balances, reaction rates profiles, temperature coefficients of reactivity and effective delayed neutron fractions. All of these parameters can be calculated by MCNP, which can provide a very detailed model of the geometry of the configurations, from fuel particles to entire fuel assemblies, using at the same time a continuous energy model. These characteristics make MCNP a very useful tool to analyze these MHTGR benchmarks. The author has used the MCNP latest version, 4.x, eld = 01/12/93 with an ENDF/B-V cross section library. This library does not yet contain temperature dependent resonance materials, so all calculations correspond to room temperature, T = 300°K. Two separate reports were made – one for the VHTRC, the other for the PROTEUS benchmark.

2104 Power Reactors, Nonbreeding, Otherwise Moderated Or Unmoderated

Refer also to citation(s) 12775

12147 (BARC–1993/E/012) **Evolution of supporting conditions for some representative feeders of 500 MWe PHWR.** Soni, R.S. (Bhabha Atomic Research Centre, Bombay (India). Reactor

Engineering Div.); Kushwaha, H.S.; Mahajan, S.C.; Kakodkar, A.; Prasad, K.H.; Gupta, K.N.; Bapat, C.N.; Sharma, V.K. Bhabha Atomic Research Centre, Bombay (India). 1993. 148p. Order Number DE94616341. Source: OSTI; NTIS (US Sales Only); INIS.

This report deals with the analysis and qualification of some representative feeders of 500 MWe PHWR. There are 196 different feeder pipe configurations for a total of 748 feeders. Analysing these many configurations is a difficult task. Therefore, the present analysis was aimed at evolving a generalised supporting criteria based on the analysis of some representative feeders. For this purpose, these feeder pipes were classified into 4 groups based on their geometrical configurations. A total of 7 feeders were selected, which broadly represent the feeders of all the 4 groups. Many of these feeders are interconnected by spacers, which make their analysis for earthquake loadings quite complex. The analysis was carried out for various loadings viz., temperature, pressure, dead weight and operating basis earthquake (OBE). The analysis for OBE loading was carried out using response spectrum Method. Based on the analysis of 7 feeders, generic supporting arrangements for feeders of various group have been suggested. The report gives in detail the input data used, mathematical modelling, analysis approach, various supporting criteria evolved, the optimised supporting criteria and the conclusions arrived at. (author). 20 refs., 18 figs., 28 tabs., 1 appendix.

12148 (IAEA-SM–332, pp. 23-24) **Advanced reactor design and safety objectives - The heavy water reactor perspective.** McKenzie, A.R. (CANDU Owners' Group (Canada)); Yu, S.K.W. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

This paper provides a summary of the major requirements for future nuclear reactors from CANDU operating station owners based on the various studies and plans prepared. Most of the specific technical requirements for Advanced Heavy Water reactor Systems are based on systematic reviews of current operating CANDU stations to identify opportunities for generic improvements in reliability, operability, maintainability and to address emerging licensing or safety issues. Hence these requirements represent those for the evolutionary development of the Advanced Heavy Water Reactor systems factoring in the considerable operating experience of the CANDU stations. This evolutionary approach to the development of advanced heavy water reactors will be consistent with a philosophy of minimizing the risk to future reactor owners whose requirements are for a reliable, low cost unit.

12149 (INIS-mf–13755) **Availability of the ECCS of a CANDU-PHWR following a small loss-of-coolant accident.** Al-Kusayer, T.A. King Saud Univ., Riyadh (Saudi Arabia). Research Center. 30 Oct 1993. 48p. Order Number DE94616342. Source: OSTI; NTIS (US Sales Only); INIS.

When loss of coolant accident (LOCA) occurs, the availability of the emergency core cooling system (ECCS) becomes the most important issue that needs to be analysed in a nuclear reactor. In order to enable the ECCS to remove the released heat from the fuel, the reactor must be shutdown. The ECCS function may be needed for several hours or days. The ECCS availability is very essential for any accident causing LOCA. The report describes ECCS failure analysis, the back-up system, ECCS mechanical failure fault tree and the ECCS unavailability calculations. 29 refs.

12150 (INIS-RU–374, pp. 48-55) **MAVR inherent safety reactor concept.** Kotov, V.M.; Chertkov, Yu.B. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Nauchno-Issledovatel'skij i Konstruktorskij Inst. Ehnergotekhniki, Moscow (Russian Federation). 1992. 70p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94619627. Source: OSTI; NTIS (US Sales Only); INIS.

The design and operation principle of the reactor, which safety and high economic efficiency at preset power generation and fuel burnup are provided due to decreasing the fuel load and time of full-power operation, decreasing the neutron utilization factor and combination of the breeding blanket function with control elements, are considered. The advantages of the design and fuel cycle suggested are shown. The ways and problems for the reactor concept further development are noted. 4 figs.

2105 Power Reactors, Breeding

Refer also to citation(s) 11625, 11626, 11860, 12283, 12502

12151 (ANL/MCT/PP–76194) **Modelling of bubbly and annular two-phase flow in subchannel geometries with BACCHUS-3D/TP.** Bottoni, M.; Lyczkowski, R.W. Argonne National Lab., IL (United States). Jan 1992. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008473. Source: OSTI; NTIS; INIS; GPO Dep.

The theoretical and computational bases of the BACCHUS-3D/TP computer program are reviewed. The computer program is used for thermal-hydraulic analyses of nuclear fuel bundles under normal and accident conditions. The present program combines two models and solution procedures previously used separately, namely, the Improved Slip Model (ISM) and the Separated-Phases Model (SPM). The former model uses mixture equations with accounting for slip between the phases, whereas the latter uses separate continuity and momentum equations. At the present stage of development, both assume thermodynamic equilibrium. Techniques used to affect smooth transition between the two models are described. including treatment of frictional pressure drop and solution of the Poisson and momentum equations. A detailed derivation of the computation of mass transfer between the phases is given because it is a central and novel feature of the model.

12152 (ANL/RA/CP–80543) **Bowing-reactivity trends in EBR-II assuming zero-swelling ducts.** Meneghetti, D. Argonne National Lab., IL (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940407–9: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94007626. Source: OSTI; NTIS; INIS; GPO Dep.

Predicted trends of duct-bowing reactivities for the Experimental Breeder Reactor II (EBR-II) are correlated with predicted row-wise duct deflections assuming use of idealized zero-void-swelling subassembly ducts. These assume no irradiation induced swellings of ducts but include estimates of the effects of irradiation-creep relaxation of thermally induced bowing stresses. The results illustrate the manners in which at-power creeps may affect subsequent duct deflections at zero power and thereby the trends of the bowing component of a subsequent power reactivity decrement.

12153 (FEI–2098) **Program for preliminary analysis of data of profilometry of the fast reactor fuel elements.** Sopov, O.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1990. 22p. (In Russian). Order Number DE94616343. Source: OSTI; NTIS (US Sales Only); INIS.

For primary analysis of profilometry data of fast reactor fuel element is developed the SCANER program. The program produces and accompanies profilometric data bases and also processes data of individual fuel element measurements along arbitrary envelopes. For finding out can shape variation laws and for data preparation foe following calculations the fuel elements are grouped in the dependence on their position in a fuel assembly, material number melting, tube party number and can diameter value. Characteristics of the groups are calculated.

12154 (FEI–2197) **Experimental studies into the processes of liquid metal coolant boiling in an annular channel.** Ivanov, E.F.; Abramychev, O.Yu.; Turkov, M.P. Gosudarstvennyj Komitet po

Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1991. 15p. (In Russian). Order Number DE94616344. Source: OSTI; NTIS (US Sales Only); INIS.

Results of investigations of liquid-metal coolant boiling (eutectic alloy of 22% Na and 78% K) in a vertical ring channel for the case of immovable coolant and forced flow are presented. Boiling is initiated by hot spot of a fuel element simulator. It is shown that in the immovable coolant a vapor bubble does not break away the hot spot, increases in volume and collapses in the place of formation. Under the forced coolant flow are observed breaking away vapor bubbles and their motion along the channel. 6 refs., 8 figs.

12155 (FEI–2212) **Determination of the BN-600 reactor fuel element parameters using nondestructive methods.** Zhilkin, A.S.; Korostin, O.S.; Ogorodov, A.N.; Lisitsyn, E.S.; Babushkin, A.N.; Lebedev, P.I.; Chuev, V.V.; Shestopalov, E.V.; Tsikunov, A.G. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1991. 34p. (In Russian). Order Number DE94616345. Source: OSTI; NTIS (US Sales Only); INIS.

The methodes are presented which are used for mass initial studies of fuel elements in the BN-600 reactor hot cell. Some primary experimental results are given. The conclusion is made that the concept of nondestructive testing permits to obtain more reliable or even qualitatively new information on the fuel elements state in comparison with traditional investigations. 8 refs., 16 figs., 4 tabs.

12156 (IAEA-SM–332, pp. 10-11) **Design trends and major technical issues of advanced non-water cooled nuclear reactors.** Kondo, Shunsuke. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Design trends and major technical issues of advanced fast breeder reactors and high temperature gas cooled reactors are discussed.

12157 (IAEA-SM–332, pp. 44-45) **An example of international co-operation: The European Fast Reactor.** Beccaro, R. del; Plessa, A.; Haigh, P. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of the paper is to present the common views of all parties involved since more than 5 years in the European Fast Reactor project, i.e., utilities, design companies and R and D organizations.

12158 (KFK–5024) **An improved method for calculating control rod reactivity worths in fast sodium cooled reactor cores.** Zwermann, W. (Gesellschaft fuer Reaktorsicherheit mbH (GRS), Garching (Germany)); Langenbuch, S.; Giese, H.; Kiefhaber, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Neutronenphysik und Reaktortechnik. May 1993. 67p. Order Number DE94747611. Source: OSTI; NTIS (US Sales Only); INIS.

An improved method is presented to determine the reactivities of strongly inhomogeneous control rod arrangements in fast sodium cooled reactor cores. The method is based on a detailed evaluation of the multiplication constants for the rods embedded in a large surrounding of fuel material. These calculations are performed using two-dimensional transport theory, with an accurate representation of the actual geometry in RΘ coordinates and with fine discretizations in coordinate space and energy. Three-dimensional whole core calculations are carried out in diffusion approximation, with a coarse spatial hexagonal-Z mesh and few energy groups, replacing the individual reactor cells by homogeneous arrangements. The homogenized macroscopic group cross sections are generated with standard methods, however using reduced boron contents of the absorber pins as compared with their actual values. The appropriate boron concentrations are found by comparing the control rod reactivity worths resulting from the two-dimensional transport calculations with those determined from corresponding diffusion calculations with homogenized compositions for the corresponding regions, which possess as many features of the final whole core calculations as possible. In this way, the corrections necessitated by the heterogeneity, transport, mesh, and condensation effects are incorporated in the macroscopic cross sections. With these as input, the computed rod worths of the secondary shutdown system of the SUPERPHENIX-1 (SPX-1) power production core are essentially improved as compared with results of earlier calculations. This progress of the calculational method is clearly demonstrated by a comparison with measured reactivity worths. (orig.)

12159 (KFK–5155) **The history of the construction and operation of the KNK II German Fast Breeder Power Plant.** Marth, W. European Fast Reactor (EFR), Karlsruhe (Germany). Aug 1993. 198p. (In German). Order Number DE94747546. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the German KNK fast breeder project from its beginnings in 1957 until permanent shutdown in 1991. The initial design provided for a sodium-cooled, but thermal reactor. Already during the commissioning of KNK I on the premises of the Karlsruhe Nuclear Research Center modification into a fast nuclear power plant was decided. Considerable difficulties in licensing had to be overcome. KNK II reached high burnup values in the fuel elements and closing of the fuel cycle was achieved. A number of technical problems concerning individual components are described in detail. After the politically motivated discontinuation of the SNR 300 fast breeder project at Kalkar, KNK II was shut down for good in August 1991. (orig.)

2106 Power Reactors, Mobile, Propulsion, Package, and Transportable

Refer also to citation(s) 12281, 12285, 12353, 12489

12160 (JAERI-M–93-223) **Development of Nuclear ship Engineering Simulation SYstem (NESSY).** Kusunoki, Tsuyoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Kyouya, Masahiko; Takahashi, Teruo; Kobayashi, Hideo; Ochiai, Masa-aki; Hashidate, Kouji. Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 186p. (In Japanese). Order Number DE94748671. Source: OSTI; NTIS; INIS.

NESSY has been developed for design studies of advanced marine reactors as a part of nuclear ship research and development since 1987. Engineering simulation model of the Mutsu, which is the first nuclear ship in Japan, was completed in March of 1993. In this report we concentration on detail description of softwares for Mutsu modeling. The aims of development of NESSY are as follows; (1) Assessment and confirmation on plant performance of an advanced marine reactor in each step of nuclear ship design (2) Development of abnormality diagnosis system and operator support system as a part of enhanced automization study, and study of human interface with hardware The characteristics of NESSY are the followings. (1) Total engineering simulation system simulate simultaneously ship motions, propulsion system behavior, and nuclear plant behavior under given weather and sea conditions. (2) Models based on physical theory as far as possible. (3) The simulator has high extensibility and flexibility. It is able to apply to other reactors, as the simulation model consists of the part of basic model and the

part of plant data which are easy to change. After completion of Mutsu modeling, we are planning to utilize this system as one of design tools for an advanced marine reactor. (author).

12161 (SAND–93-2204C) **Utilizing a Russian space nuclear reactor for a United States space mission: Flight qualification issues.** Polansky, G.F. (Phillips Lab., Albuquerque, NM (United States)); Schmidt, G.L.; Reynolds, E.L.; Schaefer, E.D.; Ogloblin, B.; Bocharov, A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940101–28: 11. symposium on space nuclear power systems, Albuquerque, NM (United States), 9-13 Jan 1994). Order Number DE94004674. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Space nuclear power and nuclear electric propulsion are considered important technologies for planetary exploration, as well as selected earth orbit applications. The Nuclear Electric Propulsion Space Test Program (NEPSTP) could provide an early flight demonstration of these technologies at relatively low cost through extensive use of existing Russian technology. The key element of Russian technology employed in the program is the Topaz II reactor. This space nuclear power system was built and flight qualified, though never tested in space, by the former Soviet Union. The NEPSTP is faced with many unique flight qualification issues. In general, the launch of a spacecraft employing a nuclear reactor power system will complicate many spacecraft qualification activities. However, the NEPSTP activities are further complicated because the reactor power system is a Russian design. Therefore, this program must deal not only with the unique flight qualification issues associated with space nuclear power, but also with differences between Russian and United States flight qualification procedures. This paper presents an overview of the NEPSTP. The program goals, the proposed mission, the spacecraft, and the Topaz II space nuclear power system are described. The subject of flight qualification is then examined. The inherent difficulties in qualifying a space reactor are described. The differences between United States and Russian flight qualification procedures are explored. A plan is then described to determine an appropriate flight qualification program for the Topaz II reactor to support a possible NEPSTP launch.

12162 (WHC-MR–0191) **Vacuum system pump down analysis.** Rohrdanz, D.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1990. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007711. Source: OSTI; NTIS; GPO Dep.

My assignment on the SP-100 Vacuum Vessel Vacuum System Team was to perform a transient pump down analysis for the vacuum vessel that will house the SP-100 reactor during testing. Pump down time was calculated for air and helium. For all cases the proposed vacuum system will be able to pump down the vessel within the required time. The use of a larger rotary piston pump (DUO250) improves the pump down time by 35 minutes and therefore should be considered. The 6-inch duct for the roughing line is optimal, however, because all cases are well below the 24 hour time frame, the 4-inch duct is sufficient. The use of the single turbomolecular pump during pump down is sufficient. A pump down with helium in the vessel and a helium inleakage delays the time to achieve the base pressure marginally and is acceptable.

2107 Regulation and Licensing

Refer also to citation(s) 12272

12163 (INIS-mf–13783) **Legislative documents connected to the systems for localization of possible accidents in the nuclear reactors of Bulgaria.** Gerchev, S.; Chobanova, G. No corporate text available. 1993. 5p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94616597. Source: OSTI; NTIS (US Sales Only); INIS.

The paper deals with the development of a set of 4 new regulation documents, concerning the rules for leak testing procedures that are of importance to the efficiency of the accident localization systems, rules as yet not present in details in the existing normative documents. The work so described is a part of the response to the recent requirements for safety improvements of the Bulgarian nuclear power reactors. The set comprises regulations for containment integral seal test by the method of absolute pressure, for a full pressure integral seal and strength test, for the design features and operation of the safety related localization systems and for a integral seal test for a system of lower pressure gloveboxes. The draft documents concern the WWER-5 type reactors as well as the requirements, criteria and norms for the localization systems of the older WWER-3 type reactors. The first three documents have passed the authorities acceptance procedure while the last one will be submitted by the end of the year. The actual effects of the regulations upon the leak testing and monitoring of the Kozloduj-5 and -6 reactors will be to bring the accuracy of the instrumentation and the measurement itself in accordance with the accepted measurement method requirements and to get the results of the procedure in real time. As for the Kozloduj-1 to -4 reactors the aim is to regulate the requirements for the measurement devices, the initial criterion and leak detection criteria according to the chosen method. (R.Ts.).

2108 Economics

Refer also to citation(s) 12109, 12110, 12113, 12148, 12156, 12168, 14281

12164 (IAEA-SM–332, pp. 3-5) **The role of nuclear power in sustainable energy strategies.** Semenov, B.A. (International Atomic Energy Agency, Vienna (Austria)); Bennett, L.L.; Bertel, E. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this paper is to provide an overview of future demand outlooks for energy, electricity and nuclear power, as a background for discussion of the design and operation aspects of advanced nuclear power systems. The paper does not attempt to forecast the actual outcomes of nuclear power programmes, since this will depend upon many factors that cannot be predicted with certainty. Rather, the paper outlines the size of the opportunity for nuclear power, in terms of the expected growth in energy and electricity demands, the need to diversify energy supply options and substitute depletable fossil fuels by other energy sources, and the need to mitigate health and environmental impacts including in particular those arising from the the atmospheric emissions from burning of fossil fuels. 7 refs.

12165 (IAEA-SM–332, pp. 6-9) **World trends and major technical issues of advanced water reactors: Summary and conclusions of TOPNUX '93.** Bacher, P. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power*

systems. Design, technology, safety and strategies for their deployment. Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Summary and conclusions of TOPNUX'93 are briefly discussed stressing world trends and major technical issues of advanced water reactors.

12166 (IAEA-SM–332, pp. 29-31) **Advanced nuclear power systems for developing countries opportunities and challenges.** Bennett, L.L. (International Atomic Energy Agency, Vienna (Austria)); Bertel, E. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Economical, technical and environmental issues, connected with use of advanced nuclear power plants for developing countries are discussed. 6 refs.

12167 (INIS-JP–018, pp. 31-38) **An economic evaluation of a storage system for casks with burnup credit.** Mimura, Masahiro (Central Research Inst. of Electric Power Industry, Komae, Tokyo (Japan). Komae Research Lab.); Tsuda, Kazuaki; Yamada, Nobuyuki; O-iwa, Akio. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

It is generally recognized that casks designed with burnup credit are more economical than those without burnup credit. To estimate how much more economical they are, we made conceptual designs of transport/storage casks with and without burnup credit for PWR and BWR fuels of various uranium enrichment. The casks were designed to contain the maximum number of fuel assemblies under the necessary weight and dimensional limitations as well as the criticality and shielding criteria. The results showed that approximately 8 % to 44 % more fuel assemblies could be contained in casks with burnup credit. We then evaluated the economy of cask storage system incorporating the cask designs obtained above both with and without burnup credit. The results showed that the cost of storing casks with burnup credit is approximately 7 % to 30 % less expensive than storing casks without burnup credit. (J.P.N.).

2109 Process Heat Reactors

12168 (IAEA-SM–332, pp. 12-13) **SMRs with special emphasis on non-power applications.** Balz, W. (Commission of the European Communities, Brussels (Belgium)); Crijns, M.J.; Girouard, P.; Llewelyn, G.I.W. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

The paper examines the possible role of small and medium-sized nuclear reactors (SMRs) for world energy supply based on recent studies by the CEC, the IAEA and the OECD/NEA, and on papers to the 3rd International Seminar on SMRs held in New Delhi in August 1991, sponsored by those organizations.

22 NUCLEAR REACTOR TECHNOLOGY

Refer also to citation(s) 13029

2201 Theory and Calculation

Refer also to citation(s) 12221

12169 (ANL/RA/CP–81724) **Distributed computing and nuclear reactor analysis.** Brown, F.B.; Derstine, K.L.; Blomquist, R.N. Argonne National Lab., IL (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940407–10: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94007635. Source: OSTI; NTIS; INIS; GPO Dep.

Large-scale scientific and engineering calculations for nuclear reactor analysis can now be carried out effectively in a distributed computing environment, at costs far lower than for traditional mainframes. The distributed computing environment must include support for traditional system services, such as a queuing system for batch work, reliable filesystem backups, and parallel processing capabilities for large jobs. All ANL computer codes for reactor analysis have been adapted successfully to a distributed system based on workstations and X-terminals. Distributed parallel processing has been demonstrated to be effective for long-running Monte Carlo calculations.

12170 (ANL/RA/CP–81815) **Parallel Monte Carlo reactor neutronics.** Blomquist, R.N.; Brown, F.B. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940456–12: 1994 Society for Computer Simulation multiconference, San Diego, CA (United States), 11-15 Apr 1994). Order Number DE94007642. Source: OSTI; NTIS; INIS; GPO Dep.

The issues affecting implementation of parallel algorithms for large-scale engineering Monte Carlo neutron transport simulations are discussed. For nuclear reactor calculations, these include load balancing, recoding effort, reproducibility, domain decomposition techniques, I/O minimization, and strategies for different parallel architectures. Two codes were parallelized and tested for performance. The architectures employed include SIMD, MIMD-distributed memory, and workstation network with uneven interactive load. Speedups linear with the number of nodes were achieved.

12171 (ERA-NRE–94-008) **Measured thermal and fast neutron fluence rates ATR Cycle 101-B, October 11, 1993–November 27, 1993.** Murray, R.K.; Rogers, J.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008432. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the thermal (2200 m/s) and fast (E>IMeV) neutron fluence rate data for ATR Cycle 101-B which were measured by the Radiation Measurements Laboratory (RML) as requested by the Power Reactor Programs (ATR Experiments) Radiation Measurements Work Order. This report contains fluence rate values corresponding to the particular elevations (relative to the 80 ft. core elevation) where the measurements were taken. The data in this report consists of (1) a table of the ATR power history and distribution, (2) a hard copy listing of all thermal and fast neutron fluence rates, (3) plots of both the thermal and fast neutron fluence rates, and (4) a magnetic record (3.5 inch diskette) containing a listing of only the fast neutron fluence rates, their assigned elevations proper header identification of all monitor positions contained herein.

12172 (INIS-BR–3264) **A model for cooling systems analysis under natural convection.** Santos, S.J. dos. Centro Tecnico Aeroespacial, Sao Jose dos Campos, SP (Brazil). Inst. Tecnologico

de Aeronautica. 1988. 129p. (In Portuguese). Order Number DE94619557. Source: OSTI; NTIS (US Sales Only); INIS.

The present work analyses thermosyphons and their non dimensional numbers. The mathematical model considers constant pressure, single-phase incompressible flow. It simulates both open and closed thermosyphons, and deals with heat sources like PWR cores of electrical heaters and cold sinks like heat exchangers or reservoirs. A computer code named STRATS was developed based on this model. (author).

2202 Components and Accessories

Refer also to citation(s) 12119, 12199, 12244, 12249, 12250, 12274, 12279, 12473, 12552, 12553, 12710, 12737

12173 (INIS-BR–3265) **Linear dynamic analysis of arbitrary thin shells modal superposition by using finite element method.** Goncalves Filho, O.J.A. Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Posgraduacao de Engenharia. Nov 1978. 189p. (In Portuguese). Order Number DE94618123. Source: OSTI; NTIS (US Sales Only); INIS.

The linear dynamic behaviour of arbitrary thin shells by the Finite Element Method is studied. Plane triangular elements with eighteen degrees of freedom each are used. The general equations of movement are obtained from the Hamilton Principle and solved by the Modal Superposition Method. The presence of a viscous type damping can be considered by means of percentages of the critical damping. An automatic computer program was developed to provide the vibratory properties and the dynamic response to several types of deterministic loadings, including temperature effects. The program was written in FORTRAN IV for the Burroughs B-6700 computer. (author).

12174 (INIS-mf–13751) **The dynamic pressure measurements of the nuclear reactor coolant for condition-based maintenance of the reactor.** Es-Saheb, M.H.H. (Department of Mechanical Engineering, King Saud University, Riyadh (Saudi Arabia)). No corporate text available. 1990. 12p. (CONF-9003342–: Symposium on maintenance planning and operations, Riyadh (Saudi Arabia), 17-19 Mar 1990). Order Number DE94616247. Source: OSTI; NTIS (US Sales Only); INIS.

The condition-based maintenance of the nuclear reactor, by monitoring and measuring the instantaneous dynamic pressure distribution of the coolant (water) impact on the solid surfaces of the reactor during operation is presented. The behaviour of water domes (jets) produced by underwater explosions of small changes of P.E.T.N. at various depths in two different size cylindrical containers, which simulate the nuclear reactor, is investigated. Water surface domes (jets) from the underwater explosions are photographed. Depending on the depth of the charge, curved and flat top jets of up to 455 mm diameter and impact speeds of up to 70 m/sec. are observed. The instabilities in the dome surfaces are observed and the instantaneous profiles are analysed. It is found that, in all cases tested, the maximum pressure takes place at the center of the jet and could reach up to 3.0 times the on-dimensional impact pressure value. The use of their measurements, as online monitoring for condition-based maintenance and design-out maintenance is discussed. 18 refs.

12175 (NUREG/CR–4816-Rev.2) **PR-EDB: Power Reactor Embrittlement Data Base, Version 2: Revision 2, Program description.** Stallmann, F.W. (Oak Ridge National Lab., TN (United States)); Wang, J.A.; Kam, F.B.K.; Taylor, B.J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Jan 1994. 126p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–10328/R2). Source: OSTI; NTIS; INIS; GPO.

Investigations of regulatory issues such as vessel integrity over plant life, vessel failure, and sufficiency of current codes Standard Review Plans (SRP's) and Guides for license renewal can be greatly expedited by the use of a well-designed computerized data base. Also, such a data base is essential for the validation of embrittlement prediction models by researchers. The Power Reactor Embrittlement Data Base (PR-EDB) is such a comprehensive collection of data for US commercial nuclear reactors. The current version of the PR-EDB contains the Charpy test data that were irradiated in 252 capsules of 96 reactors and consists of 207 data points for heat-affected-zone (HAZ) materials (98 different HAZ), 227 data points for weld materials (105 different welds), 524 data points for base materials (136 different base materials), including 297 plate data points (85 different plates), 119 forging data points (31) different forging), and 108 correlation monitor materials data points (3 different plates). The data files are given in dBASE format and can be accessed with any computer using the DOS operating system. "User-friendly" utility programs are used to retrieve and select specific data, manipulate data, display data to the screen or printer, and to fit and plot Charpy impact data. The results of several studies investigated are presented in Appendix D.

12176 (NUREG/CR–5990) **The effects of solar-geomagnetically induced currents on electrical systems in nuclear power stations.** Subudhi, M. (Brookhaven National Lab., Upton, NY (United States)); Carroll, D.P.; Kasturi, S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Brookhaven National Lab., Upton, NY (United States); Florida Univ., Gainesville, FL (United States); MOS, Inc., Melville, NY (United States). Jan 1994. 186p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52359). Source: OSTI; NTIS; INIS; GPO.

This report presents the results of a study to evaluate the potential effects of geomagnetically induced currents (GICs) caused by the solar disturbances on the in-plant electrical distribution system and equipment in nuclear power stations. The plant-specific electrical distribution system for a typical nuclear plant is modeled using the ElectroMagnetic Transient Program (EMTP). The computer model simulates online equipment and loads from the station transformer in the switchyard of the power station to the safety-buses at 120 volts to which all electronic devices are connected for plant monitoring. The analytical model of the plant's electrical distribution system is studied to identify the transient effects caused by the half-cycle saturation of the station transformers due to GIC. This study provides results of the voltage harmonics levels that have been noted at various electrical buses inside the plant. The emergency circuits appear to be more susceptible to high harmonics due to the normally light load conditions. In addition to steady-state analysis, this model was further analyzed simulating various plant transient conditions (e.g., loss of load or large motor start-up) occurring during GIC events. Detail models of the plant's protective relaying system employed in bus transfer application were included in this model to study the effects of the harmonic distortion of the voltage input. Potential harmonic effects on the uninterruptable power system (UPS) are qualitatively discussed as well.

12177 (ORNL/FTR–4813) **Travel to France to attend the Specialists Meeting and Irradiation Embrittlement and Optimization of Annealing: Foreign trip report, September 18–29, 1993.** Corwin, W.R. Oak Ridge National Lab., TN (United States). 18 Oct 1993. 38p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002186. Source: OSTI; NTIS (US Sales Only); GPO Dep.

After presentations and discussions by delegates from 17 countries, the conclusions and recommendations from the Specialists Meeting on Irradiation Embrittlement and Optimization of Annealing included: the need to develop a comprehensive predictive model for irradiation embrittlement based on mechanisms of irradiation damage and validated by a common international data base of all surveillance data; that annealing appears to provide a viable means for extending the useful life of reactor vessels but must be examined for more materials and irradiation variables; that better fundamental understanding of embrittlement mechanisms needs to be developed through the use of ultra-fine scale microstructural characterization techniques; and that surveillance programs and regulations concerning vessel integrity that incorporate more direct determinations of fracture toughness need to be developed. Discussions at the Nuclear Research Center, in Mol, Belgium,

included reconstituted and miniature impact specimen testing technology, fracture toughness predictions for surveillance applications, fracture modeling, and decommissioning efforts. Existing and suggested US-Belgian collaborative research efforts were discussed and evaluated.

12178 (SR/H–689) **[Plutonium finishing project materials of construction].** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. [1965]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94008392. Source: OSTI; NTIS (US Sales Only); GPO Dep.

These notes discuss the physical properties of materials evaluated for use in the plutonium finishing project. Considered materials include: 400 series stainless steels, AM-355, A-286, 17-4 PH, hastelloy alloys, and cobalt-based alloys. Threading is a primary concern.

2203 Fuel Elements

Refer also to citation(s) 12131, 12145, 12155, 12197, 12217, 12219, 12220, 12226

12179 (ANL/RA/CP–81715) **VIM Monte Carlo versus CASMO comparisons for BWR advanced fuel designs.** Pallotta, A.S. (Commonwealth Edison Co., Chicago, IL (United States)); Blomquist, R.N. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940407–11: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94007633. Source: OSTI; NTIS; INIS; GPO Dep.

Eigenvalues and two-dimensional fission rate distributions computed with the CASMO-3G lattice physics code and the VIM Monte Carlo Code are compared. The cases assessed are two advanced commercial BWR pin bundle designs. Generally, the two codes show good agreement in K_{inf}, fission rate distributions, and control rod worths.

12180 (INIS-JP–018, pp. 131-135) **Development of on-site spent fuel transfer system designs.** Lambert, R.W. (Electric Power Research Inst., Palo Alto, CA (United States)); Pennington, C.W.; Guerra, G.V. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The Electric Power Research Institute (EPRI) of the United States has sponsored development of conceptual designs for accomplishing spent fuel transfer from spent fuel pools to casks and from one cask to another. Under an EPRI research contract, transnuclear has developed several concepts for spent fuel transfer systems. (J.P.N.).

12181 (INIS-JP–018, pp. 155-162) **Plutonium content, uranium content, and subcriticality data of spent fuels.** Kobayashi, I. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Suzaki, T.; Okuno, H.; Naito, Y. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Japan Atomic Energy Research Institute (JAERI) has an experimental program to measure subcriticality data of spent fuel assemblies in a storage pond. The objectives of the experiment are to apply an exponential experiment technique for obtaining benchmark data for verification of criticality calculation codes, for demonstrating the experiment technique as a method for the preloading burnup measurement, and to present systematic data about fissile isotopic content, burnup history and etc. that are needed in verification of burnup calculation codes. (J.P.N.).

2204 Control Systems

Refer also to citation(s) 12278, 12282

12182 (BARC–1993/E/023) **Guidelines for design and development of computer/microprocessor based systems in research and power reactors.** Dhodapkar, S.D. (Bhabha Atomic Research Centre, Bombay (India). Reactor Control Div.); Chandra, A.K. Bhabha Atomic Research Centre, Bombay (India). 1993. 46p. Order Number DE94616271. Source: OSTI; NTIS (US Sales Only); INIS.

Computer systems are being used in Indian research reactors and nuclear power plants in the areas of data acquisition, process monitoring and control, alarm annunciation and safety. The design and evaluation of these systems requires a special approach particularly due to the unique nature of the software which is an essential constituent of these systems. It was decided to evolve guidelines for designing and review of computer/microprocessor based systems for use in nuclear power plants in India. The present document tries to address various issues and presents guidelines which are as comprehensive as possible and cover all issues relating to the design and development of computer based systems. These guidelines are expected to be useful to the specifiers, designers and reviewers of such systems. (author). 6 refs., 1 fig.

12183 (INIS-mf–13784) **Aspects of optimization of the means and methods for monitoring of the Kozloduy NPP personnel functional state.** Pandov, E.; Popandreeva, A.; Dincheva, E. Vissh Massinno-Elektrotekhnicheski Inst., Sofia (Bulgaria); Meditsinska Akademiya, Sofia (Bulgaria). 1993. 3p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94618139. Source: OSTI; NTIS (US Sales Only); INIS.

Equipment and methods for testing and evaluation of the physiological and psychological condition of the nuclear power plant operators are the subject of the paper. Reaction-meter, mnemoperceptioscope and the apparatus 'Sredets' have been developed and used in order to test the sensory-motor reactions, the short-term memory and the operation-related memory according to a list of test completion periods and number of mistakes. The strain on the nuclear reactor operators has been found to be greater than that of the personnel in dozens of other professions tested by the same methods. For sustaining the operators efficiency it is considered necessary to develop and implement: 1) fast screening method and equipment for an initial functional condition testing on application for important jobs; 2) methods for current recovery evaluation in connection to the working shift; 3) methods and instruments for a fast incidental functional condition control of the operating personnel. (R.Ts.).

12184 (INIS-mf–13789) **Advanced digital reactivity meter for nuclear power plant with WWER reactors.** Apostolov, T.; Nikolov, N.; Ivanov, K.; Petrova, T.; Litiski, V.; Bagdasarov, R.; Vtorov, M.; Bolotnij, V. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika; IPPE, Obninsk (Russian Federation). 1993. 6p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94618140. Source: OSTI; NTIS (US Sales Only); INIS.

The PC-based DR-8 digital reactivity-meter has been developed jointly by INRNE (Sofia) and IPPE (Obninsk). The input is a neutron flux signal from KNK-56, KNK-53M and KNK-4 ionization chambers in the current range 10^{-11} A - 10^{-3} A from analog input channels, and in the range 10^{+2} - $5x10^{+5}$ imp/s from impulse input channels. There is an automatically switch function from impulse channels to an analogue one. The reactivity measurement range is: from -25 β_{eff} to 0.8 β_{eff}. The display of the flux and reactivity values includes digital and analogue indicators on the front panel. Digital signals for power and reactivity can be transmitted to the high-speed PC AT/XT by an optional RS-232 interface. It can work in two regimes: on-line (the data are recorded digitally and are displayed graphically) and off-line (the recorded data are summarized and evaluated by a simultaneous processing to decrease the measurement error from the γ-ray background). The DR-8 reactivity-meter

can be used as an accurate device for on-line reactivity control during the reactor physics tests at the initial start-up, refuelling and operation of WWER-440 and WWER-1000. Seven items have been successfully implemented at the Kozloduy NPP. (author).

12185 (INIS-RU–365, pp. 82-89) **Automation of program model developing for complex structure control objects: Using an example of nonlinear dynamic model of NPP power unit.** Ivanov, A.P.; Sizova, T.B.; Mikhejkina, N.D.; Sankovskij, G.A.; Tyufyagin, A.N. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 94p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94616244. Source: OSTI; NTIS (US Sales Only); INIS.

A brief description of software for automated developing the models of integrating modular programming system, program module generator and program module library providing thermal-hydraulic calcualtion of process dynamics in power unit equipment components and on-line control system operation simulation is given. Technical recommendations for model development are based on experience in creation of concrete models of NPP power units. 8 refs., 1 tab., 4 figs.

12186 (INIS-RU–365, pp. 89-92) **An integrated system for developing and analysing research models of NPP technological equipment.** Zinin, A.I. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 94p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94616244. Source: OSTI; NTIS (US Sales Only); INIS.

The PRIM integrated system providing for unification of the simulating model design, assembling and study as well as the results analysis using graphics is considered. It is designed for automated similation of continuous-discrete dynamic systems, includes the library of mathematical models for technological circuit elements, interactive subsystems for mathematical model construction and simulation initial condition formulation, subsystem for dynamic variable graphic visualization and monitor for simulating model composition. 3 refs.

12187 (JAERI-M–93-165) **Effects of concurrent verbalization on problem solving process: An experimental study.** Watanabe, Megumi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Takahashi, Hideaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 62p. (In Japanese). Order Number DE94748539. Source: OSTI; NTIS; INIS.

We investigated experimentally effects of concurrent verbalization on problem solving process by using indicators with which we could analyze precisely variation of problem solving process and also discussed Ericsson and Simon's prediction about effects of verbalization. In the experiment we used two kinds of tasks which were different in information form in short-term memory. One was linguistic and another was spatial. In a spatial task, effects of task difficulty was also examined. Results of verbalization effects on time to perform were consistent with Ericsson and Simon's prediction but results of effects on the quality of performance were not. In the most difficult question of spatial tasks, effects of verbalization made the quality better. Our results show that it is difficult to predict effects of verbalization accurately by Ericsson and Simon's verbalization model because they don't take into consideration interaction between task difficulty and roles of verbalization for thinking and they don't discuss how to define appropriate task difficulty. (author).

12188 (JAERI-M–93-166) **The present status of the study on the validity of concurrent verbalization.** Watanabe, Megumi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Takahashi, Hideaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 42p. (In Japanese). Order Number DE94748541. Source: OSTI; NTIS; INIS.

We reviewed study on the validity of the method of verbal reports. The method of verbal reports gives us detailed information about human cognitive process as compared with observing a sequence of actions, while it is subjected to criticism for the validity as data. Ericsson and Simon proposed a model of verbalization and investigated conditions to keep verbal reports valid. Although a lot of studies quote their model as a base of adopting the method of verbal reports, verification the validity of verbal reports is incomplete because effects of verbalization is not clear. We pointed out that it is necessary to take into consideration kinds of task strategies, effects of trial repetition, effects of task difficulty to examine precisely effects of verbalization. (author).

12189 (NEI-DK–1374) **MOHAWC. Models of human activities in work contexts.** Brehmer, B.; Andersen, H.B. Risoe National Lab., Roskilde (Denmark). Jun 1993. 111p. Order Number DE94618141. Source: OSTI; NTIS; INIS.

The overall objective of the MOHAWC Action is to formulate and extend a unifying framework for cognitive studies of human agents coping with complex work domains. Central issues are methods for analysis and representation of knowledge about complex domains, analysis of cognitive control, mental models and heuristics applied in complex work domains, distributed decision making and forms of cooperative work, the role of tacit knowledge in agents' performance in complex work domains, and cognitive simulation methods for testing models of cognitive performance. The nature of computer mediated work and how such work should be designed and organised to be optimally effective and satisfying is considered. The focus is mainly on various forms of process industry, such as nuclear power and steel production. Dynamic decision making, where the decision-maker has to make a series of interdependent decisions under conditions where the state of the system with which he or she is working changes, both as a consequence of the decision maker's actions and autonomously, and where the decisions must be made in real time is analysed. MOHAWC taxonomy has played a central role as a framework for identifying important research problems and for integrating results. The Risoe team has contributed a major analysis of and illustration of how the MOHAWC taxonomy can be used in the design of interfaces. (AB) (97 refs.).

2205 Environmental Aspects

Refer also to citation(s) 11624, 12163, 12719, 13096, 13101, 13114

12190 (HW–19906) **Calculation of activity induced in diatomaceous earth.** Lewis, M. Hanford Works, Richland, WA (United States). 9 Jan 1951. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006700. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/ radioactive effluents; DIATOMACEOUS EARTH; CLEANING; RADIATION MONITORING; REACTOR COOLING SYSTEMS; REACTOR CHANNELS

12191 (HW–34821) **Reduction of rear face Zn^{65} activity.** de Halas, D.R.; Gay, R.H. Hanford Works, Richland, WA (United States). 31 Jan 1955. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006690. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses two methods which have been considered to reduce the rear face activity. The first involves the use of a solids purge to scour out the activity, and the second employs the use of a chromic acid purge to put the activity into solution. Solids purging is found to be ineffective in reducing rear face activity levels. A chromic acid purge conducted at 60 C for 1/2 hour can be expected to reduce the Zn^{65} activity level about five fold without injuring the reactor or causing any harmful aftereffects.

12192 (HW–89073) **Regional survey monthlies 1947.** Paas, H.J.; Berlin, W.C. Jr. Hanford Works, Richland, WA (United States). 30 Jul 1947. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006980. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report provides the monthly radiation monitoring sampling surveys for 1947.

12193 (INIS-GB–559) **Nuclear Electric and the environment 1990-1993: A progress report.** Edelstahlwerk Witten AG (Germany). 1993. 24p. Order Number DE94615965. Source: OSTI; NTIS (US Sales Only); INIS.

The process of generating electricity has an impact on the environment in which we live, whatever form of generation is used. Nuclear generation, while it has the advantage of producing virtually no acid or greenhouse gases, is no exception. What Nuclear Electric can do, as the producer of over one-fifth of the electricity supplied in England and Wales, is to minimise and to control the adverse effects of our operations on the environment. This first environmental report covers the period since Nuclear Electric was formed in March 1990. It describes what we are doing to harmonise our activities both radiological and non-radiological with the natural environment, to limit environmental impacts and to make efficient use of natural resources and gives targets that we have set ourselves which we will report back on in future annual environmental reports. (author).

12194 (INIS-mf–13823) **General state of biosphere radioactivity in Bulgaria for the period after 1986 according to control data of the Ministry of Health.** Petkov, T.; Badulin, V.; Zlatanova, R.; Shopov, N. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 8p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94619320. Source: OSTI; NTIS (US Sales Only); INIS.

The study comprises a wide range of environmental objects responsible for human health as atmospheric fallouts, ground level air, drinking water, plants, commercial food products - milk, meat, flour. The data are derived from the state radiation control during the first year after Chernobyl. It is concluded that for this period the radionuclide contamination of the food products is considerably below the interim standards. Infringements of these standards are observed in isolated cases only. 2 figs. (A.B.).

12195 (INIS-mf–13829) **Radioactivity of the Kozloduy NPP environment in the period 1987 - 1991.** Petkov, T.; Zlatanova, R.; Badulin, V. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 9p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617878. Source: OSTI; NTIS (US Sales Only); INIS.

The evaluation is based on the analysis of samples from 6 points in the NPP torch zone and two controls. Specific radiochemical methods and nondestructive gamma-spectroscopy are used for determination of strontium-90, cesium-137 and beta radioactivity in different parts of the biogeocenose chain: atmospheric fallouts, soils, bottom sediments, surface waters, milk and plants. The total analysis show that the radiation condition of the investigated objects from the Kozloduy NPP environment is a consequence of the purification of the atmosphere from the post-Chernobyl-injected radionuclides. The operation of the Kozloduy units has not significantly influenced the radiation level of the observed objects in the controlled area. 2 tabs. (A.B.).

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 11620, 11701, 11887, 12123, 12190, 12191, 12260, 12261, 12264, 12265, 12266, 12268, 12696, 12734, 13096

12196 (ANL/EP/CP–81423) **Analyses of Greek Research Reactor with mixed HEU-LEU Be reflected core.** Deen, J.R. (Argonne National Lab., IL (United States)); Snelgrove, J.L.; Papastergiou, K. Argonne National Lab., IL (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310185–9: 16. international meeting on reduced enrichment for research and test reactors (RERTR), Ibaraki (Japan), 3-7 Oct 1993). Order Number DE94004611. Source: OSTI; NTIS; GPO Dep.

The fuel-cycle analyses presented in this paper provide specific steps to be taken in the transition from a 36-element water-reflected HEU core to a 33-element LEU equilibrium core with a Be reflector on two faces. The first step will be to install the Be reflector and remove the highest burnup HEU fuel. The smaller Be-reflected core will be refueled with LEU fuel. All analyses were performed using a planar 5-group REBUS3 model benchmarked to VIM Monte Carlo. In addition to fuel cycle results, the control rod worth, reactivity response to increased fuel and water temperature and decreased water density were compared for the transition core and the reference HEU core.

12197 (ANL/RERTR/TM–18) **Proceedings of the 1990 International Meeting on Reduced Enrichment for Research and Test Reactors.** Argonne National Lab., IL (United States). Jul 1993. 447p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9009108–: International meeting on reduced enrichment for research and test reactors, Newport, RI (United States), 23-27 Sep 1990). Order Number DE94006497. Source: OSTI; NTIS; INIS; GPO Dep.

The global effort to reduce, and possibly, eliminate the international traffic in highly-enriched uranium caused by its use in research reactors requires extensive cooperation and free exchange of information among all participants. To foster this free exchange of information, the Reduced Enrichment Research and Test Reactor (RERTR) Program, at Argonne National Laboratory, sponsored this meeting as the thirteenth of a series which began in 1978. The common effort brought together, past, a large number of specialists from many countries. On hundred twenty-three participants from 26 countries, including scientists, reactor operators, and personnel from commercial fuel suppliers, research centers, and government organizations, convened in Newport, Rhode Island to discuss their results, their activities, and their plans relative to converting research reactors to low-enriched fuels. As more and more reactors convert to the use of low-enriched uranium, the emphasis of our effort has begun to shift from research and development to tasks more directly related to implementation of the new fuels and technologies that have been developed, and to refinements of those fuels and technologies. It is appropriate, for this reason, that the emphasis of this meeting was placed on safety and on conversion experiences. This individual papers in this report have been cataloged separately.

12198 (BNWL-CC–337-Del.) **Tritium release from lithium silicate and lithium aluminate, in-reactor and out-of-reactor.** Johnson, A.B. Jr. Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 3 Nov 1965. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006963. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Considerable technology has developed for production of tritium in metallic target systems. At normal N-Reactor temperatures (~ 300°C), aluminum-lithium alloys appear to offer a satisfactory system for tritium production. However, reactor safety requirements have generated interest in a target system which will hold the lithium in place at temperatures to 1200°C. At the same time, gas retention at irradiation temperatures (~300°C) must be acceptable, and extraction of the product must be practical. To determine in-reactor gas release characteristics of the silicate and aluminate materials, targets were irradiated in quartz and aluminum capsules. Following irradiation, the gas (condensible and noncondensible fractions) released in-reactor was recovered by drilling the capsules. Subsequently, the targets were recovered and heated in a laboratory vacuum system to investigate characteristics of tritium and helium evolution as a function of temperature. The experimental procedures are discussed briefly, with details in the Appendix. The results of the study are discussed in terms of in-reactor release and later in terms of laboratory extractions.

12199 (CONF-940538–2) **Total quality management for addressing suspect parts at the Oak Ridge High Flux Isotope Reactor.** Hendrix, K.A. (Oak Ridge National Lab., TN (United States)); Tulay, M.P. Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 48. annual quality

congress; Las Vegas, NV (United States); 24-26 May 1994. Order Number DE94000483. Source: OSTI; NTIS; INIS; GPO Dep.

Martin Marietta Energy System (MMES) Research Reactors Division (RRD), operator of the High Flux Isotope Reactor (HFIR) recently embarked on an aggressive Program to address the issue of suspect Parts and to enhance their procurement process. Through the application of TQM process improvement, RRD has already achieved improved efficiency in specifying, procuring, and accepting replacement items for its largest research reactor. These process improvements have significantly decreased the risk of installing suspect parts in the HFIR safety systems. To date, a systematic plan has been implemented, which includes the following elements: Process assessment and procedure review; Procedural enhancements; On-site training and technology transfer; Enhanced receiving inspections; Performance supplier evaluations and source verifications integrated processes for utilizing commercial grade products in nuclear safety-related applications. This paper will describe the above elements, how a partnership between MMES and Gilbert/Commonwealth facilitated the execution of the plan, and how process enhancements were applied. We will also present measures for improved efficiency and productivity, that MMES intends to continually address with Quality Action Teams.

12200 (DUN–1728) **Classification 100 Areas chemical discharges.** Schroeder, O.C. Douglas United Nuclear, Inc., Richland, WA (United States). 18 Nov 1966. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (HAN–96016). Order Number DE94007881. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This note refers to the classification of two letters on reactor water flow.

12201 (EGG-NPR–10795) **Target particle internal pressure study.** Anderl, R.A.; Pawelko, R.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008518. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report documents an experimental study of the internal gas composition and pressure for unirradiated and irradiated NPR-MHTGR target particles. The study emphasized measurements of the internal gases released during ambient temperature (22°C) fracturing of the unirradiated and irradiated particles. For each of the particle types tested, the number of moles of internal gases was obtained by measuring the pressure rise in an evacuated test chamber following in-situ fracture of the particles. Identification of the internal gases was made by mass-spectrometric analysis of the released gases. To complement these measurements, thermal desorption/tritium-counting experiments were performed for samples of intact $LiAl_5O_8$, kernels and samples of C/SiC fragments recovered from the fracture/gas-release experiments. These measurements, made in a gas-flow loop with an in-line ion chamber to measure the tritium evolving from heated specimens, provided tritium release rates as a function of specimen temperature and they determined the total tritium contents in the kernel and C/SiC samples. Based on these experiments, we determined that the internal free gas composition is a strong function of irradiation condition, especially irradiation temperature.

12202 (ETDE-IT–94-08) **Specification of fast neutron radiation quality from cell transformation data.** Coppola, M. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute). No corporate text available. 1992. 10p. Order Number DE94752490. Source: OSTI; NTIS (US Sales Only).

Experimental data on the neoplastic transformation of C3H 10T1/2 cells measured at Casaccia after neutron and X-ray irradiation were used to determine neutron RBE values for the RSV-Tapiro fast reactor energy spectrum and for monoenergetic neutrons of 0.5, 1, and 6 MeV. In parallel, micro-dosimetric measurements provided the actual lineal energy distributions and related mean parameters for the reactor radiation. From these experiments, values of the neutron quality factor were derived for the reactor neutron energy spectrum and, in turn, for the other neutron energies tested. A mathematical expression giving a smooth dependence on neutron energy was also determined for the effective quality factor in the entire energy range examined. The results were compared with other proposals.

12203 (HW–3-1766) **Pile discharge water monitoring: Final report, IDS-19.** Weller, B.L. Hanford Works, Richland, WA (United States). 23 Feb 1945. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006960. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/failed element detection; FUEL RODS; RUPTURES; REACTOR COOLING SYSTEMS; RADIATION MONITORING; WATER; PROGRESS REPORT

12204 (HW–3-2593) **100-F unit purge May 20, 1945.** Dahlen, P.A. Hanford Works, Richland, WA (United States). 29 May 1945. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006704. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/reactor channels; REACTOR CHANNELS/cleaning; CLEANING; FILMS; PRESSURE DROP; FLUID FLOW; FLOW RATE; FILTERS

12205 (HW–3-2638) **100-B Unit purge June 14, 1945.** Dahlen, P.A. Hanford Works, Richland, WA (United States). Jun 1945. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006079. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/cleaning; CLEANING; FILTERS; PRESSURE DROP; FLOW RATE; FLUID FLOW; MAINTENANCE; FILMS; DEPOSITION

12206 (HW–3-3046) **100-B unit purge May 20, 1945.** Dahlen, P.A. Hanford Works, Richland, WA (United States). 28 May 1945. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006703. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/reactor channels; REACTOR CHANNELS/cleaning; CLEANING; FILTERS; FILMS; PRESSURE DROP; FLOW RATE

12207 (HW–13292) **Technical report to the general advisory committee.** Greninger, A.B. Hanford Works, Richland, WA (United States). 10 May 1949. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006679. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report provides a discussion of technical activities at the Hanford Works as of May 10, 1949.

12208 (HW–21404) **Removal of ruptured slug from tube No. 2278-H.** Lewis, C.G. Hanford Works, Richland, WA (United States). 15 Jun 1951. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006709. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/fuel rods; FUEL RODS/ruptures; FUEL RODS/removal; RUPTURES; REMOVAL; OUTAGES; MAINTENANCE

12209 (HW–21413) **Removal of ruptured slug from tube 1174-D.** DeVoss, H.G. Hanford Works, Richland, WA (United States). 20 Jun 1951. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006708. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/fuel rods; FUEL RODS/ruptures; FUEL RODS/removal; RUPTURES; REMOVAL; OUTAGES; MAINTENANCE; FAILURES

12210 (HW–21461) **Removal of ruptured P-10 target slug from tube No. 1584-H.** Lewis, C.G. Hanford Works, Richland, WA (United States). 27 Jun 1951. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006707. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/fuel rods; FUEL RODS/ruptures; FUEL RODS/removal; RUPTURES; REMOVAL; OUTAGES; MAINTENANCE

12211 (HW–21560) **Removal of ruptured slug from tube No. 3486-H.** Hubbard, E.T. Hanford Works, Richland, WA (United

States). 6 Jul 1951. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006706. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/fuel rods; FUEL RODS/ruptures; FUEL RODS/removal; MAINTENANCE; OUTAGES; CONTAMINATION; RUPTURES; REMOVAL

12212 (HW–21659) **Production Test 105-389-P graphite sample boring from process channels: Final report.** Cole, J.B. Hanford Works, Richland, WA (United States). 10 Jul 1951. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007326. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The study of radiation damage to the graphite moderator is largely dependent upon the availability of graphite samples from the moderator itself. Because of the varied temperature-flux history and complicated structure of the piles, it is impossible to study the problem from the laboratory standpoint alone. The samples of greatest interest are those taken from the sections of the moderator which have received the greatest damage. However, a comprehensive study requires samples from all sections of the graphite moderator. It is desirable that these samples be solid in order that physical and dimensional measurements of all types may be made. Solid samples enable thermal conductivity measurements and the gradients of damage across tube blocks to be measured. To provide such samples, it was necessary to design some device which would cut solid samples from any location in the pile through the process Channels. The graphite core borer was desigred specifically for this purpose. The objective of this Production Test was to test the operation of the core barer and evaluate the results of its performance.

12213 (HW–22201-Del.) **Four years at Hanford.** Hanford Works, Richland, WA (United States). [1951]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007810. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Operation, rehabilitation, and expansion of Hanford Works was undertaken by GE from Sept. 1946 to the end of 1950. As a result of engineering progress, graphite reactors continue to be the country's primary source of plutonium in production quantities; at the end of 1950, the plutonium production rate from the Hanford reactors was 299% of the 1946 rate with a 67% increase in reactor facilities. Improvements to existing plant facilities and processes resulted in savings of $53.3 M; in addition, it would have been necessary, in order to produce the amount of Pu delivered through 1950, to have constructed facilities costing $225.4 M if the following improvements had not been made: an irradiation-stable uranium slug; annealing of graphite; increased operating power level of the reactors; and improved separation methods. Tritium production, health/safety, and community management are mentioned.

12214 (HW–24055) **Production Test 105-3-MR: The use of dicalite diatomaceous earth as a purge material in the 100 areas.** Conley, W.R. Hanford Works, Richland, WA (United States). 8 Apr 1952. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006702. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/reactor channels; REACTOR CHANNELS/cleaning; DIATOMACEOUS EARTH/materials testing; WATER TREATMENT; CLEANING

12215 (HW–24429) **Corrosion limits on pile power levels.** Shields, R.J. Hanford Works, Richland, WA (United States). 16 May 1952. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006705. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this report is to present a basis for the application of slug corrosion rate data to corrosion limitations on pile power levels.

12216 (HW–27555) **Coring pattern for K Pile.** Foster, L.E. Hanford Works, Richland, WA (United States). 30 Mar 1953. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006713. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Pile operation data from 100-H and 100-C has demonstrated that symmetrical heat generation (flux distribution) can be attained with enrichment or enrichment and shortened control rods. The previous coring pattern was based on 100-H operation prior to enrichment and therefore was designed to accomodate an asymmetrical flux distribution. Because the present K reactor design includes shortened control rods and operation will probably include enrichment, the coring design has been revised to a symmetrical pattern. The purpose of this document is to present the coring pattern recommended for the 105-K moderator design.

12217 (HW–34196) **The corrosion of Hanford fuel elements: Method for the treatment and analyses of in-pile corrosion data.** DeHalas, D.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 21 Dec 1954. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006684. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The corrosion rates of slug jackets exposed in the Hanford piles are monitored to determine optimum operating conditions and to evaluate proposed changes in process specifications. Selected process tubes are charged with weighed slugs, and the coolant flow rate and temperature rise through the tubes are recorded until the slugs are discharged. The corrosion rates of these control slugs are computed from weight loss data after discharge. The data obtained in this manner are used to find the relationship between slug jacket corrosion rates and the various conditions of power and temperature that are encountered in the piles. This report covers all of the corrosion data obtained to date for slugs that have been cooled with the currently specified process water, which is alum-coagulated and contains 2 ppm sodium dichromate as an inhibitor (see Appendix II for the water composition). All of the slugs were normal production pieces canned in 2-S aluminum.

12218 (HW–37137-RD) **Redox Phase 3 capacity.** McDonald, D. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 7 Jun 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006976. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. REDOX PROCESS/capacity; HANFORD PRODUCTION REACTORS/capacity; CAPACITY; FUEL RODS; RUPTURES; SEPARATION EQUIPMENT

12219 (HW–55261) **Production Test No. IP-149-D, Irradiation Service Request No. HAPO-215: The irradiation of uranium dioxide.** Marshall, R.K. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 10 Mar 1958. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006978. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. FUEL RODS/thermal conductivity; URANIUM DIOXIDE/thermal conductivity; URANIUM DIOXIDE/irradiation; HANFORD PRODUCTION REACTORS; WATER COOLED REACTORS; IRRADIATION; TESTING

12220 (HW–56523) **In-reactor corrosion of X-8001 and 1245 aluminum: Analysis of data from PT IP-42A.** Dillon, R.L.; Richman, R.B. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 25 Jun 1958. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006683. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Failures of standard fuel element jackets (1245 aluminum alloy) after relatively short Hanford reactor exposures are occurring at high reactor power levels. Metallographic examination of fuel element jackets from short exposure ruptures shows the cause of failure to be rapid intergranular corrosion. This type of attack has been reproduced in laboratory tests by exposure to water at temperatures above 200 C, or to steam at temperatures higher than 300 C. Flow disruptions due to misalignment of the fuel elements within the reactor process tube, worn tube ribs, etc., are believed to cause the high local jacket temperatures necessary for the occurrence of intergranular corrosion.

12221 (HW–68377) **Thermal and fission neutron flux measurements in process tubing and in neutron activation test locations.** Perkins, R.W. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 2 Feb 1961. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006687. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Neutron activation analysis provides the extremely high sensitivity necessary for the measurement of many trace elements. Activation techniques are presently being used to measure the concentrations of various undesirable parent isotopes in reactor process tubing, slug jackets and their corrosion film, and in process vater and vater treatment chemicals. The interpretation of results from activation analysis are sometimes complicated by the fact that a given radioisotope may be produced by fission neutrons (threshold reactions) from other elements as well as by the more common thermal neutron (n,γ) reactions. Shielding the sample with cadmium prior to irradiation or irradiating in the graphite reflector will minimize the contributions from thermal or fission neutrons, respectively. The purpose of this study has been to measure the ratios and magnitudes of the thermal and fission fluxes in process tubing and to compare these with values at locations where neutron activations can be performed. Also, it was of interest to measure the ratios and magnitudes of the thermal and fission fluxes from a point in the lattice to a point well into the graphite reflector, and to determine if the fission neutron spectrum as measured by two threshold reactions, changes appreciably over this region. These data will aid in selecting the most favorable available positions for activations with thermal neutron reactions or with threshold reactions.

12222 (HW–79305) **Production of zirconium-niobium-95 and scandium-46 at Hanford.** Warren, J.H. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 18 Oct 1963. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006718. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS; SCANDIUM 46/production; ZIRCONIUM ALLOYS/production; NIOBIUM ALLOYS/production; NIOBIUM 95; COST; SEPARATION PROCESSES; PRODUCTION

12223 (HW–79650) **Production of zirconium-niobium-95 and scandium-46 at Hanford, Addendum to HW-79404.** Johnson, W.E. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Nov 1963. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006717. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/ isotope production; NIOBIUM 95; ZIRCONIUM; SCANDIUM 46; COST; PROCESS CONTROL

12224 (INIS-mf–13753) **A safety decision analysis for Saudi Arabian nuclear research facility.** Abulfaraj, W.H. (Department of Nuclear Engineering, King Abdulaziz University, Jeddah, (Saudi Arabia)); Abdul-Fattah, A.F. No corporate text available. 1985. 14p. (CONF-8512163–: 7. Miami international conference on alternative energy sources, Miami Beach, FL (United States), 5 Dec 1985). Order Number DE94616353. Source: OSTI; NTIS (US Sales Only); INIS.

Establishment of a nuclear research facility should be the first step in planning for introducing the nuclear energy to Saudi Arabia. The fuzzy set decision theory is selected among different decision theories to be applied for this analysis. Four research reactors from USA are selected for the present study. The IFDA computer code, based on the fuzzy set theory is applied. Results reveal that the FNR reactor is the best alternative for the case of Saudi Arabian nuclear research facility, and MITR is the second best. 17 refs.

12225 (INIS-RU–374, pp. 3-19) **Nuclear materials testing centre in NIKIEhT Sverdlovsk filial and its experimental and methodical capabilities.** Barsanov, V.I. (and others); Golovachev, M.G.; D'yakov, A.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Nauchno-Issledovatel'skij i Konstruktorskij Inst. Ehnergotekhniki, Moscow (Russian Federation). 1992. 70p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94619627. Source: OSTI; NTIS (US Sales Only); INIS.

The materials testing center including the IVV-2M research reactor and a set of protective chambers is described. The pool-type reactor core has the flux up to $2x10^{14}$ neutron/(cm^2xs)(E>0.1 MeV). Irradiation capsules and ampoules, in which in-pile experiments are made, are located in cavities of reactor core, fuel assemblies, reflector and beryllium blocks. The protective chambers are located in the building for the post-irradiation examination. 12 refs., 4 tabs., 4 figs.

12226 (INIS-RU–374, pp. 56-67) **IVV-2M fuel assembly tests under pulsed loading and accident with coolant loss of flow.** Golosov, O.A.; Timokhin, A.N.; Semerikov, V.B.; Kozlov, A.V.; Kartashev, E.F.; Lisovoj, V.F.; Sokolov, A.V.; Vasil'ev, Yu.S.; Kaz'min, Yu.M. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Nauchno-Issledovatel'skij i Konstruktorskij Inst. Ehnergotekhniki, Moscow (Russian Federation). 1992. 70p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94619627. Source: OSTI; NTIS (US Sales Only); INIS.

Experimental data of the IVV-2M research reactor fuel assembly testing in a pulsed reactor under conditions of power bursts and flow-stop simulating in respect to the loading character accidents connected with positive reactivity insertions and rapid rupture of the primary coolant circuit intake pipeline during reactor operation at nominal power level with account for the emergency protection system signal delay time are given. 6 refs., 2 tabs., 2 figs.

12227 (IPEN-PUB–391) **Fission track dating method: I. Study of neutron flux uniformity in some irradiation positions of IEA-R1 reactor.** Osorio, A.M. (UNESP, Presidente Prudente, SP (Brazil). Dept. de Ciencias Ambientais); Khouri, M.C.; Hadler, J.C.; Iunes, P.J.; Paulo, S.R. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). Jun 1993. 22p. (In Portuguese). Order Number DE94616354. Source: OSTI; NTIS (US Sales Only); INIS.

In order to use the fission track dating method the flux gradient was verified within the sample holder, in some irradiation positions of the IEA-R1 reactor at IPEN/CNEN, Sao Paulo. The fission track dating method considers only the thermal neutron fission tracks, to subtract the other contributions sample irradiations with a cadmium cover was performed. The neutron flux cadmium influence was studied. (author).

12228 (JAERI-M–93-016, pp. 17-24) **Post-irradiation examination facility for power reactor fuel at KAERI.** Kim, Eun-Ka (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Lee, Key-Soon; Ro, Seung-Gy. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The post irradiation examination facility (PIEF) at Korea Atomic Energy research Institute (KAERI) consists of three pools, four heavy concrete cells, and two lead cells. It provides adequate support services of post irradiation examination (PIE) for nuclear power reactor fuels as well as for experiments associated with reactor safety studies, and fuel design and fabrication improvements. Capability of the PIEF includes in-pool nondestructive examination, in-cell nondestructive examination, metallographic examination and chemical composition analyses of irradiated nuclear fuels. PIE facility was put into service for nuclear power plant fuel from 1987. (author).

12229 (JAERI-M–93-016, pp. 25-38) **Post irradiation study and in-reactor study for fundamental researches in open university facility.** Shikama, Tatsuo (Tohoku Univ., Oarai, Ibaraki (Japan). Oarai Branch, Inst. for Materials Research); Narui, Minoru; Ogawa, Yutaka; Kayano, Hideo; Sagawa, Tsutomu; Endo, Yasuichi. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The Oarai Branch of Institute for Materials Research of Tohoku University is the facility open for university researchers whose major concern is radiation effects on materials and fuels. To satisfy a variety of demands from the researchers, we are carrying out the irradiation in the JMTR, under the following guidelines, with close cooperation with concerned JAERI laboratories. 1. Prompt response to need of the researches. 2. Minimizing radiation hazards to the researchers. 3. Irradiation under well-controlled conditions. 4. Real time measurements of radiation effect in the reactor. The current major research topics in the university groups can be categorized into following four. 1. Establishing the neutron correlation with well-defined irradiation conditions. 2. Developments of highly irradiation resistant materials. (Developing evaluation techniques using miniature specimens.) 3. Study of dynamic radiation effects. 4. Study of materials containing actinide elements. In this paper, we will describe the general status of our activities in the reactor irradiation and the post irradiation experiments, briefly. The major part will be devoted to our efforts on the in-situ experiments in the JMTR. (author).

12230 (JAERI-M–93-016, pp. 39-46) **Current status and further advancement of NDC fuel hot laboratory.** Yamaguchi, Y. (Nuclear Development Corp., Tokai, Ibaraki (Japan)); Shiraishi, S.; Ando, T.; Abeta, S. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Nuclear Development Corporation (NDC) has facilities necessary for research and development such as fuel hot laboratory, material hot laboratory, uranium enrichment experiment laboratory and unirradiated fuel components testing laboratory. This report describes the present situation and future advancement of the fuel hot laboratory. (J.P.N.).

12231 (JAERI-M–93-016, pp. 47-57) **Present status of JMTR Hot Laboratory.** Oyamada, R. (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Satoh, H.; Usui, T. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The hot laboratory facility (JMTRHL) associated with the Japan Materials Testing Reactor (JMTR) was founded to examine the specimens irradiated mainly in the JMTR, and has been put into service since 1971. A wide variety of postirradiation examinations (PIEs) such as various non-destructive examinations and destructive examinations on nuclear fuels and materials, reactor core components and other materials for research and development to be utilized in nuclear field is available using the JMTRHL. In addition to PIEs, re-capsuling including re-instrumentation for power ramping tests using the BOCA (BOiling water CApsule) are currently conducted actively. The JMTRHL is located adjacent to the JMTR and the both are connected by water canal of 6 m in depth and 3 m in width, which is used for transportation of capsules irradiated in the JMTR and ones for re-irradiation in the JMTR. There are three kinds of β–γ hot cells in the JMTRHL, i.e. concrete cells with microscope lead cells attached, lead cells and steel cells. Post Irradiation Examinations (PIEs) on mainly fuel and material specimens are conducted in the former cells and in the latter two cells, respectively. The development of new PIE techniques are underway in the JMTRHL in order to accommodate the user's requirements in accordance with the increasing needs corresponding to the expansion of nuclear utilization in Japan. (author).

12232 (JAERI-M–93-016, pp. 58-63) **Overview of Department of Hot Laboratories.** Ichihashi, Y. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ishimoto, K. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

In order to introduce the overview of the Department of Hot Laboratories, this paper presents the administrative matters such as the organization, the role of each facility, operation budget and future works of the department. (author).

12233 (JAERI-M–93-016, pp. 64-72) **Current status of the Reactor Fuel Examination Facility.** Yamahara, T. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Aizawa, S. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The Reactor Fuel Examination Facility (RFEF) at JAERI Tokai Research Establishment started its operation in December, 1979 for carrying out postirradiation examination (PIE) of the full-size power reactor fuel assembly. The purpose of PIE is to confirm the integrity of power reactor fuels, to verify the appropriateness of these fuel design and to provide highly reliable data on fuel behavior. The major advantage of beta-gamma concrete cells is to have to capability to carry out PIEs for both fuel assembly and fuel rod holding vertically. In these cells, various non-destructive examinations of the fuel assembly and fuel rod and destructive examinations of the fuel rod have been performed. As of September 1992, RFEF has carried out PIEs of 13 fuel assemblies and some fuel rods withdrawn from the fuel assemblies in the reactor sites. To respond to new PIE needs, RFEF has been developing PIE techniques and apparatus such as non-destructive measurement of the oxide thickness on the cladding using an eddy current probe, high temperature annealing test on the irradiated pellet, thermal conductivity and melting temperature measurements of the irradiated pellet. This paper describes an outline and current status of RFEF. (author).

12234 (JAERI-M–93-016, pp. 73-86) **Present status of the Research Hot Laboratory.** Kikuchi, T. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Arase, I. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The Research Hot Laboratory (RHL) is a comprehensive beta-gamma hot cell facility. It was constructed in 1961 at the site between JRR-1 and JRR-2 in the Tokai Research Establishment to support the examinations of fuels and materials irradiated in the research reactors and expanded in 1965 to provide surveillance data of fuels, pressure vessel steels and graphite materials for the commercial Magnox reactor. The facility now consists of ten concrete hot cells and thirty eight lead hot cells. The typical works available of post-irradiation examinations are dismantling, dimension measurement, x-ray radiography, gamma-spectrometry, electrolytic deconsolidation, tensile test, notch-bar Charpy impact test, metallography, Vickers hardness test, scanning electron microscopy, x-ray diffraction, etc. The activities in recent years in the RHL include post-irradiation examinations of pre-irradiated LWR fuels tested in the NSRR, fuels of research reactors, fuels and pressure vessel steels of magnox reactor, fuels and materials for HTGR, etc. (author).

12235 (JAERI-M–93-016, pp. 209-217) **Present status of mechanical testing technology at the Research Hot Laboratory.** Kizaki, M. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Tobita, T.; Koya, T.; Kikuchi, T. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Mechanical tests of irradiated metallic materials at the Research Hot Laboratory(RHL) have been carried out for 30 years to support material research in JAERI and to evaluate the irradiation integrity of pressure vessel steel in commercial power plant. Two tensile

testing machines and one Charpy impact testing machine are available for the examinations. One of the tensile testing machines has 1000 kgf load capacity under the vacuum of $\approx 10^{-7}$ torr at the temperature of 1300degC max.. The other one has 10 tonf load capacity, and is utilized for the multi-purpose tests such as tensile and compressive tests in air atmosphere at the temperature between -160 and 900degC. Examinations cover tensile test, bending test, J_{Ic} fracture toughness test, low cycle fatigue test and so on. Charpy impact testing machine with notched-bar specimen is instrumented with 30 kgf-m capacity in the temperature range of -140 - 240 degC. To support these mechanical tests in RHL, special jigs, devices and instruments have been developed. (author).

12236 (JAERI-M–93-016, pp. 218-228) **Development of post-irradiation examination techniques for HTTR structural material.** Ohmi, M. (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Mimura, H.; Yonekawa, M.; Satoh, H.; Oyamada, R. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Post-irradiation examinations (PIEs) on heat resistant alloys used for the High Temperature Engineering Test Reactor (HTTR) which is now under construction, are one of major PIE works in the JMTR Hot Laboratory facility (JMTR HL). The structural materials tested are Alloy 800H for the control rod cladding, 2 1/4Cr-1Mo steel for the reactor pressure vessel and 1Cr-1Mo-0.25V steel for the bolts, etc.. PIE techniques developed mainly for the HTTR are creep tests to obtain high temperature creep property and low cycle fatigue tests to obtain high temperature fatigue property. Newly developed PIE techniques for the study of irradiation effects on reactor pressure vessel materials are carried out to clarify dynamic fracture toughness of reactor structural materials using an instrumented Charpy impact testing machine. This report describes the present status of material tests with emphasis on PIE techniques newly developed for the HTTR. (author).

12237 (JAERI-M–93-016, pp. 229-240) **Application of ICP spectrometry to analysis of elements in waste forms.** Togashi, Y. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Tamura, Y.; Matsumoto, S.; Kikuchi, A. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The purpose of the test at the Waste Safety Testing Facility (WASTEF) is to get information on the confinement performance of waste forms. In a leaching behavior as one of the examples, it is necessary to analyze exactly a very small amounts of the elements dissolved from waste forms to leachant. At WASTEF, chemical and radioactive analyses are generally used to attain the objective described above. In the chemical analysis, Atomic Absorption Spectrometry (AAS) and Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) are adopted at WASTEF. Recently, the new ICP atomic emission spectrometer for analyzing the hot samples with radioactive nuclide was installed in new glove box, which was designed from the points of view of sealing and radiation shielding. The characterization tests on the new spectrometer were carried out using standard solutions containing many kinds of the elements, such as Al, Ca, Nd, Li, Ni, Ce, Fe, Cr, Zr, Zn, La, B, Si and P and standard glass. The coefficient of variation for the intensity of spectrum reduces with increasing integration time. The intensity of the spectrum in short duration exists in a stable state. However, the intensity in long duration decreases with time. The intensity of the spectrum greatly changes with the small variation of carrier gas flow rate. The detection limits and the lower limits of determination for the elements are estimated. The standard glass can be analyzed with the accuracy within 5 % and the precision of 10 %. (author).

12238 (JAERI-M–93-016, pp. 259-267) **Release of fission products from plate type fuel at elevated temperature.** Komori, Y. (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Shimizu, M.; Iwai, T.; Saito, J.; Nakagawa, T.; Oyamada, R.; Saito, M. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

The fuel conversion of the JMTR (Japan Materials Testing Reactor) from the 45%-enriched UAlx-Al fuel to 20%-enriched U_3Si_2-Al fuel is scheduled in 1993, and the safety analysis for the core conversion was carried out. To study fission product retention capability for the safety analysis, the out-of-pile experiment on fission products releases of iodine and rare gases from the U_3Si_2-Al fuel was conducted in the temperature range of 600-1100degC. The $U_3Si_{1.5}$-Al and UAlx-Al fuels were also included in the experiment to be compared with the U_3Si_2-Al fuel. Experimental results showed that the silicide fuels have the retention capability which is equivalent to the aluminide fuel, and better than the U-Al alloy fuel. (author).

12239 (JAERI-M–93-154) **Measurements of neutron fluxes and cadmium ratio at equilibrium core in JRR-3M.** Ohtomo, Akitoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sasajima, Fumio; Ishida, Takuya; Shigemoto, Masamitsu; Takahashi, Hidetake; Maejima, Takeshi; Sekine, Katsunori. Japan Atomic Energy Research Inst., Tokyo (Japan). Aug 1993. 52p. (In Japanese). Order Number DE94748537. Source: OSTI; NTIS; INIS.

Construction and characteristics tests of JRR-3M (Modified JRR-3) had been completed on October 1990, and the reactor reached to equilibrium core in July 1991. Measurements of neutron flux and cadmium ratio in Hydraulic irradiation facility (HR) and Pneumatic irradiation facility (PN) at 20 MW reactor power were carried out for the equilibrium core from May to August 1991 and for the latest core in April 1993. The results at the equilibrium core and the latest core are described in this paper. (author).

12240 (JAERI-M–93-226) **Annual report of department of research reactor, 1992: April 1, 1992 to March 31, 1993.** Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1993. 247p. (In Japanese). Order Number DE94748693. Source: OSTI; NTIS; INIS.

The department of research Reactor is responsible for the operation, maintenance, utilization and related R and D works of the research reactors including JRR-2, JRR-3M (new JRR-3) and JRR-4. This report describes the activities of our department in fiscal year of 1992 and it also includes some of the technical topics on the works mentioned above. As for the research reactors, we carried out the operation, maintenance, irradiation utilization, neutron beam experiments, technical management including fuels and water chemistry, radiation monitoring as well as related R and D works. The international cooperations between the developing countries and our department were also made concerning the operation, utilization and safety analysis for nuclear facilities. (author).

12241 (JAERI-M–93-237) **Annual report on operation, utilization and technical development of hot laboratories: From April 1, 1992 to March 31, 1993.** Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1993. 128p. (In Japanese). Order Number DE94748685. Source: OSTI; NTIS; INIS.

Relating to the reorganization carried out in 1991, the subjects of operation and study for the Reactor Fuel Examination Facility (RFEF), the Waste Safety Testing Facility (WASTEF) and Research Hot Laboratory (RHL) which belong to the Department of Hot laboratories were revised. RFEF and RHL conducted post-irradiation examinations and WASTEF conducted waste safety tests along the new subjects, respectively. The contents of this report are operation, utilization and technical development at RFEF, WASTEF and RHL in fiscal year 1992. (author).

12242 (JAERI-M–93-239) **Annual report of the JMTR: The JMTR operation and technical development No. 7 (fiscal 1992).** Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1993. 124p. (In Japanese). Order Number DE94748686. Source: OSTI; NTIS; INIS.

The Japan Materials Testing Reactor (JMTR) is capable of a wide variety of irradiations under controlled environmental conditions. The JMTR has been used to perform engineering tests on nuclear fuels and components, for general materials testing, and for radioisotope production since 1970. The JMTR was operated 5 cycles in fiscal 1992, and extensive irradiation tests including power ramping tests were performed. The development of the latest irradiation and post irradiation examination (PIE) technology, such as the thermocouple instrumentation technique to an irradiated fuel and the measurement technique of irradiation embrittlement with non-destructive inspection, is being carried out in the JMTR. The investigation of irradiation behaviors for the blanket materials in the fusion reactor is also being carried out. The core conversion to low-enrichment uranium (LEU) fuel in the JMTR will be fully completed in January 1994. (author).

12243 (LA–12716-T) **Reactivity effects of void formations in a solution critical assembly.** Walters, S.G. Los Alamos National Lab., NM (United States). Jan 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94006127. Source: OSTI; NTIS; GPO Dep.

Thesis submitted to North Carolina State Univ., Raleigh, NC.

SHEBA II (Solution High Energy Burst Assembly) was constructed in order to better understand the neutronics of solutions of fissile materials. In order to estimate the effect on criticality from the formation of bubbles, models were devised in MCNP (Monte Carlo Neutron Photon transport code) and THREEDANT (THREE dimensional, Diffusion-Accelerated, Neutral-Particle Transport). It was found that the formation of voids in all but the outside bottom edge of the assembly cylinder tend to act as a negative insertion of reactivity. Also, an experiment has been designed which will verify the results of the codes.

12244 (NUREG/CR–6076) **TR-EDB: Test Reactor Embrittlement Data Base, Version 1.** Stallmann, F.W. (Oak Ridge National Lab., TN (United States)); Wang, J.A.; Kam, F.B.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Jan 1994. 108p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12415). Source: OSTI; NTIS; INIS; GPO.

The Test Reactor Embrittlement Data Base (TR-EDB) is a collection of results from irradiation in materials test reactors. It complements the Power Reactor Embrittlement Data Base (PR-EDB), whose data are restricted to the results from the analysis of surveillance capsules in commercial power reactors. The rationale behind their restriction was the assumption that the results of test reactor experiments may not be applicable to power reactors and could, therefore, be challenged if such data were included. For this very reason the embrittlement predictions in the Reg. Guide 1.99, Rev. 2, were based exclusively on power reactor data. However, test reactor experiments are able to cover a much wider range of materials and irradiation conditions that are needed to explore more fully a variety of models for the prediction of irradiation embrittlement. These data are also needed for the study of effects of annealing for life extension of reactor pressure vessels that are difficult to obtain from surveillance capsule results.

12245 (SAND–92-0808) **Characterization of the SPR II generated radiation environments next to and within a guidance system.** Kelly, J.G.; Griffin, P.J. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007251. Source: OSTI; NTIS; GPO Dep.

The neutron fluences and spectra and the gamma ray doses inside and in the vicinity of a guidance system exposed to the Sandia Pulsed Reactor II (SPR II) in four configurations have been determined. This project required customization of the environment and the application of new techniques to determine the spectra within the system. The required radiation environment was achieved, and the experimental results clearly demonstrated that the radiation environment inside the system was very different from that seen outside. This example demonstrates very clearly that experimenters must consider the effect the test apparatus may have on the environment inside the system.

12246 (SAND–93-1925C) **Design optimization analysis of the new SPR III-M reactor.** Miller, J.D. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940407–5: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94006373. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the finite element method analysis which was used to refine the SPR III-M reactor fuel assembly mechanical design to withstand the stresses and strains of pulse-mode operation, which induces thermal shock loading in the fuel assembly components. The original reactor design was analyzed for its structural response to separate pulses at increasingly severe levels. Subsequent calculations at one consistent pulse level examined several design modifications, which will result in a significant reduction in stress in the final design.

12247 (SAND–93-3996C) **Medical isotope production: A new research initiative for the Annular Core Research Reactor.** Coats, R.L.; Parma, E.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940407–4: Topical meeting on advances in reactor physics, Knoxville, TN (United States), 11-14 Apr 1994). Order Number DE94006521. Source: OSTI; NTIS; INIS; GPO Dep.

An investigation has been performed to evaluate the capabilities of the Annular Core Research Reactor and its supporting Hot Cell Facility for the production of ^{99}Mo and its separation from the fission product stream. Various target irradiation locations for a variety of core configurations were investigated, including the central cavity, fuel and reflector locations, and special target configurations outside the active fuel region. Monte Carlo techniques, in particular MCNP using ENDF B-V cross sections, were employed for the evaluation. The results indicate that the reactor, as currently configured, and with its supporting Hot Cell Facility, would be capable in meeting the current US demand if called upon. Modest modifications, such as increasing the capacity of the external heat exchangers, would permit significantly higher continuous power operation and even greater ^{99}Mo production ensuring adequate capacity for future years.

12248 (SR/H–665) **Pile operations: Preparation for starting.** Hanford Engineer Works, Richland, WA (United States). 25 Jul 1945. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94004703. Source: OSTI; NTIS (US Sales Only); GPO Dep.

These memorandums detail P Department activities related to reactor startup and operation.

12249 (SR/H–674) **Savannah River Plant 200 Areas: Corrosion evaluated stainless steel.** Rion, W.C. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 20 Apr 1964. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94006787. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This rough draft is a proposed specification for corrosion evaluated 304L wrought material and 308L weld metal for Savannah River Plant use. This is a first effort it follows somewhat the format of SW820M in that acceptable standard mill products are listed. ASTM specifications rather than Du Pont Specifications have been used wherever possible.

12250 (SR/H–675) **Field procurement of commercial grade austenitic stainless steel.** Cornwall, R.H. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept. 22 Jul 1964. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94006788. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides specifications and standards for procurement of stainless steel type 304L.

12251 (SR/H–680) **[Specifications for procurement of 304L stainless steel].** Christy, W.O. Hanford Engineer Works, Richland, WA (United States). 4 Dec 1964. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001.

Order Number DE94007140. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. STAINLESS STEEL-304L/procurement; SPECIFICATIONS; PROCUREMENT; SAVANNAH RIVER PLANT; CORROSION RESISTANCE; INVENTORIES

12252 (SR/H–687) **Think list! Procurement of stainless steel: Meeting October 7, 1965, Building 723-A, 8:30 A.M.** DeLong, W.B. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 30 Sep 1965. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94008390. Source: OSTI; NTIS (US Sales Only); GPO Dep.

At a recent Corrosion Committee meeting the problems of dealing with our first cut at a new purchasing procedure for SIS at SRP were recited. It subsequently appeared that a number of concessions might be made which would minimize the clerical burden while still not letting down our guard on the procurement of the most important items of S/S in stores. Since then, S. R. Nemeth has prepared a summary, dated September 27, of the forms, sizes and quantities of SIS in SRP stores; copy Is attached. You are invited to attend a meeting on Thursday, October 7 at 8:30 A.M. In Building 723-A Conference Room, prepared to discuss and comment on these points. The objective of this session is t.o come to an agreement oil a set of principles that can be incorporated into a revised version of DPSOL-208-W-104. In recent weeks, consideration has been given to the preparation of a procedure for procurement of SIS that will minimize the incidence of intergranular corrosion at SRP. Over the past several years, a number of failures has necessitated difficult and major repairs of primary process equipment. These incidents have clearly demonstrated the role of carbide precipitation in SIS (sensitization) in causing failure by intergranular corrosion in the process streams in essentially all areas. The fact that failures of this type could occur in high purity water, such as the moderator system, was unprecedented at the time of plant construction (and still is elsewhere). Hence, no attention was given to the selection of steel for its resistance to sensitization nor to the degree to which it was sensitized in the course of fabrication.

2209 Reactor Safety

Refer also to citation(s) 11853, 11860, 11873, 12119, 12141, 12142, 12152, 12197, 12212, 12612, 12696

12253 (ANL/FC/CP–79262) **Nuclear criticality safety program at the Fuel Cycle Facility.** Lell, R.M. (Argonne National Lab., IL (United States)); Fujita, E.K.; Tracy, D.B.; Klann, R.T.; Imel, G.R.; Benedict, R.W.; Rigg, R.H. Argonne National Lab., IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940417–3: 4. international conference on nuclear fuel reprocessing and waste management, London (United Kingdom), 24-28 Apr 1994). Order Number DE94007913. Source: OSTI; NTIS; INIS; GPO Dep.

The Fuel Cycle Facility (FCF) is designed to demonstrate the feasibility of a novel commercial-scale remote pyrometallurgical process for metallic fuels from liquid metal-cooled reactors and to show closure of the Integral Fast Reactor (IFR) fuel cycle. Requirements for nuclear criticality safety impose the most restrictive of the various constraints on the operation of FCF. The upper limits on batch sizes and other important process parameters are determined principally by criticality safety considerations. To maintain an efficient operation within appropriate safety limits, it is necessary to formulate a nuclear criticality safety program that integrates equipment design, process development, process modeling, conduct of operations, a measurement program, adequate material control procedures, and nuclear criticality analysis. The nuclear criticality safety program for FCF reflects this integration, ensuring that the facility can be operated efficiently without compromising safety. The experience gained from the conduct of this program in the Fuel cycle Facility will be used to design and safely operate IFR facilities on a commercial scale. The key features of the nuclear criticality safety program are described. The relationship of these features to normal facility operation is also described.

12254 (ANL/RE/CP–81947) **Direct containment heating experiments in Zion Nuclear Power Plant geometry using prototypic materials.** Binder, J.L.; McUmber, L.M.; Spencer, B.W. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931160–41: American Nuclear Society (ANS) winter meeting, San Francisco, CA (United States), 14-18 Nov 1993). Order Number DE94006826. Source: OSTI; NTIS; INIS; GPO Dep.

Direct Containment Heating (DCH) experiments have been completed which utilize prototypic core materials. The experiments reported on here are a continuation of the Integral Effects Testing (IET) DCH program. The experiments incorporated a 1/40 scale model of the Zion Nuclear Power Plant containment structures. The model included representations of the primary system volume, RPV lower head, cavity and instrument tunnel, and the lower containment structures. The experiments were steam driven. Iron-alumina thermite with chromium was used as a core melt stimulant in the earlier IET experiments. These earlier IET experiments at Argonne National Laboratory (ANL) and Sandia National Laboratories (SNL) provided useful data on the effect of scale on DCH phenomena; however, a significant question concerns the potential experiment distortions introduced by the use of non-prototypic iron/alumina thermite. Therefore, further testing with prototypic materials has been carried out at ANL. Three tests have been completed, DCH-U1A, U1B and U2. Three tests have been completed, DCH-U1A, U1B and U2. DCH-U1A and U1B employed an inerted containment atmosphere and are counterpart to the IET-1RR test with iron/alumina thermite. DCH-U2 employed nominally the same atmosphere composition of its counterpart iron/alumina test, IET-6. All tests, with prototypic material, have produced lower peak containment pressure rises; 45, 111 and 185 kPa in U1A, U1B and U2, compared to 150 and 250 kPa IET-1RR and 6. Hydrogen production, due to metal-steam reactions, was 33% larger in U1B and U2 compared to IET-1RR and IET-6. The pressurization efficiency was consistently lower for the corium tests compared to the IET tests.

12255 (BF-R–40056-01) **Experimental and analytical studies for the validation of HTR-VGD and primary cell passive decay heat removal. Main volume. Summary of results: Final report.** Geiss, M.; Haefner, W.; Hejzlar, P.; Kneer, A.; Schulz, R.; Wolf, L. Battelle-Institut e.V., Frankfurt am Main (Germany). Geschaeftsbereich Energie- und Verfahrenstechnik. Apr 1993. 108p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03BTI2035. Order Number DE94747572. Source: OSTI; NTIS (US Sales Only); INIS.

The alternative concept for a modular HTR-reactor design by Siempelkamp, Krefeld, using a prestressed cast iron vessel (VGD) combined with a cast iron/concrete module for the primary cell with integrated passive decay heat removal system was fully qualified with respect to operational and accidental thermal loads. The main emphasis was to confirm and validate the passive decay heat removal capability. An experimental facility (INWA) was designed, instrumented and operated with an appropriate electrical heating system simulating steady-state operational and transient accidental thermal loads. The experiments were accompanied by extensive computations concerning the combination of conductive, radiative and convective energy transport mechanisms in the different components of the VGD/primary cell structures, as well as elastic-plastic stress analyses of the VGD. In addition, a spectrum of potential alternatives for passive energy removed options have been parametrically examined. The experimental data clearly demonstrate that the proposed Siempelkamp-design is able to passively and safely remove the decay heat for operational and accidental conditions without invalidating technological important thermal limits. This also holds in case of failures of both the natural convection system and ultimate heat sink by outside concrete water film cooling. (orig./HP). 14 refs., 9 tabs., 65 figs.

12256 (BF-R–40056-02) **Experimental and analytical studies for the validation of HTR-VGD and primary cell passive decay heat removal. Supplement. Measurements: Final report.** Haefner, W.; Kneer, A.; Schulz, R. Battelle-Institut e.V., Frankfurt

am Main (Germany). Geschaeftsbereich Energie- und Verfahrenstechnik. Apr 1993. 370p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03BTI2035. Order Number DE94747574. Source: OSTI; NTIS (US Sales Only); INIS.

The alternative concept for a modular HTR-reactor design by Siempelkamp, Krefeld, using a prestressed cast iron vessel (VGD) combined with a cast iron/concrete module for the primary cell with integrated passive decay heat removal system was fully qualified with respect to operational and accidental thermal loads. The main emphasis was to confirm and validate the passive decay heat removal capability. An experimental facility (INWA) was designed, instrumented and operated with an appropriate electrical heating system simulating steady-state operational and transient accidental thermal loads. The experiments were accompanied by extensive computations concerning the combination of conductive, radiative and convective energy transport mechanisms in the different components of the VGD/primary cell structures, as well as elastic-plastic stress analyses of the VGD. In addition, a spectrum of potential alternatives for passive energy removed options have been parametrically examined. The experimental data clearly demonstrate that the proposed Siempelkamp-design is able to passively and safely remove the decay heat for operational and accidental conditions without invalidating technological important thermal limits. This also holds in case of failures of both the natural convection system and ultimate heat sink by outside concrete water film cooling. (orig./HP)

12257 (BF-R–40056-03) **Experimental and analytical studies for the validation of HTR-VGD and primary cell passive decay heat removal. Supplement. Calculations: Final report.** Geiss, M.; Giannikos, A.; Hejzlar, P.; Kneer, A. Battelle-Institut e.V., Frankfurt am Main (Germany). Geschaeftsbereich Energie- und Verfahrenstechnik. Apr 1993. 276p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03BTI2035. Order Number DE94747573. Source: OSTI; NTIS (US Sales Only); INIS.

The alternative concept for a modular HTR-reactor design by Siempelkamp, Krefeld, using a prestressed cast iron vessel (VGD) combined with a cast iron/concrete module for the primary cell with integrated passive decay heat removal system was fully qualified with respect to operational and accidental thermal loads. The main emphasis was to confirm and validate the passive decay heat removal capability. An experimental facility (INWA) was designed, instrumented and operated with an appropriate electrical heating system simulating steady-state operational and transient accidental thermal loads. The experiments were accompanied by extensive computations concerning the combination of conductive, radiative and convective energy transport mechanisms in the different components of the VGD/primary cell structures, as well as elastic-plastic stress analyses of the VGD. In addition, a spectrum of potential alternatives for passive energy removed options have been parametrically examined. The experimental data clearly demonstrate that the proposed Siempelkamp-design is able to passively and safely remove the decay heat for operational and accidental conditions without invalidating technological important thermal limits. This also holds in case of failures of both the natural convection system and ultimate heat sink by outside concrete water film cooling. (orig./HP)

12258 (BNL-NUREG–49018) **Independent assessment of MELCOR as a severe accident thermal-hydraulic/source term analysis tool.** Madni, I.K. (Brookhaven National Lab., Upton, NY (United States)); Eltawila, F. Brookhaven National Lab., Upton, NY (United States). [1994]. 11p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940518–1: International conference on nuclear systems thermal hydraulics, Pisa (Italy), 30 May - 2 jun 1994). Order Number DE94005191. Source: OSTI; NTIS; INIS; GPO Dep.

MELCOR is a fully integrated computer code that models all phases of the progression of severe accidents in light water reactor nuclear power plants, and is being developed for the US Nuclear Regulatory Commission (NRC) by Sandia National Laboratories (SNL). Brookhaven National Laboratory (BNL) has a program with the NRC called "MELCOR Verification, Benchmarking, and Applications," whose aim is to provide independent assessment of MELCOR as a severe accident thermal-hydraulic/source term analysis tool. The scope of this program is to perform quality control verification on all released versions of MELCOR, to benchmark MELCOR against more mechanistic codes and experimental data from severe fuel damage tests, and to evaluate the ability of MELCOR to simulate long-term severe accident transients in commercial LWRs, by applying the code to model both BWRs and PWRs. Under this program, BNL provided input to the NRC-sponsored MELCOR Peer Review, and is currently contributing to the MELCOR Cooperative Assessment Program (MCAP). This paper presents a summary of MELCOR assessment efforts at BNL and their contribution to NRC goals with respect to MELCOR.

12259 (CONF-940402–5) **MORECA-GT: Interactive simulator for gas-turbine modular HTGR transients and heatup accidents with ATWS options.** Ball, S.J.; Nypaver, D.J. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International topical meeting on the safety of advanced reactors; Pittsburgh, PA (United States); 18-20 Apr 1994. Order Number DE94007218. Source: OSTI; NTIS; INIS; GPO Dep.

An interactive simulation code for studying postulated heatup accidents in modular high-temperature gas-cooled reactors (MHTGRs) has been adapted to assist with parametric design studies of the US Department of Energy's (DOE's) direct-cycle gas-turbine MHTGR concept. The studies show that the proposed MHTGR designs are very robust and can generally withstand the consequences of extremely low probability accidents with little or no damage to the reactor's fuel or metallic components.

12260 (DUN–5298-RD) **Section IV reactor incident file: General information from 1945.** Hirschel, D.L. Douglas United Nuclear, Inc., Richland, WA (United States). 10 Jan 1969. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007830. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report includes three separate reactor incident reports. The first incident report covers a series of Panellit scrams on the KE reactor that occurred on 10-17-67 and 10-18-67. Cause of these scrams was determined to be plugging on crossheader screens. The second incident report covers the KE reactor shutdown on Nov. 27, 1962, caused by upstream plugging in tube 0570. The third incident report covers the scram of reactor F on 7-27-61, due to a Panellit low trip on 3063. The 3063 tube had a leak.

12261 (DUN–5538-RD) **Presentation charts for 3560-KW incident.** Heacock, H.W. Douglas United Nuclear, Inc., Richland, WA (United States). 28 Feb 1969. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007873. Source: OSTI; NTIS (US Sales Only); GPO Dep.

On 6-19-68, the KW reactor was scrammed. The cause of the scram was a flow blockage of a coolant channel. Results were extensive fuel jacket melting and about 20 curies of I-131 released to the river. This report covers the following: (1) review of incident and recovery operation; (2) investigation of incident; and (3) technological studies and analysis.

12262 (EUR–14454) **CEC thermal-hydraulic benchmark exercise on Piploc verification experiment F2 in Battelle model containment. Experimental phases 2, 3 and 4. Results of comparisons.** Fischer, K. (Battelle-Institut e.V., Frankfurt am Main (Germany)); Schall, M.; Wolf, L. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 194p. Contract ETNU-001-D. Source: OSTI; NTIS (US Sales Only); INIS.

This presents results of Phase II of CEC thermal-hydraulic benchmark exercise on Piploc verification experiment F2 in Battelle model containment, experimental phases 2, 3 and 4, organized/sponsored by Commission of European Communities for understanding and analysis of long-term thermal-hydraulic phenomena inside containments during and after severe core accidents. This benchmark exercise received high European attention with eight organizations (six countries) participating with eight computer codes during phase 2. Altogether 18 results from computer code

runs were supplied by participants and constitute the basis for comparisons with experimental data here. This reflects both the high technical interest in, as well as complexity of, this CEC exercise. Major comparison results between computations and data are reported on all important quantities relevant for containment analyses during long-term transients. These comparisons comprise pressure, steam and air content, velocities and their directions, heat transfer coefficients and saturation ratios. Agreements and disagreements are discussed for each participating code/institution, conclusions drawn and recommendations provided. The phase 2 CEC benchmark exercise provided an up-to-date state-of-the-art status review of the thermal-hydraulic capabilities of present computer codes for containment analyses. This exercise has shown that all of the participating codes can simulate the important global features of the experiment correctly, like: temperature stratification, pressure and leakage, heat transfer to structures, relative humidity, collection of sump water. Several weaknesses of individual codes were identified, and this may help to promote their development. As a general conclusion it may be said that while there is still a wide area of necessary extensions and improvements, the present containment codes represent a good basis for multi-compartment modelling (Abstract Truncated).

12263 (GRS-F–1/1992) **Reports on research programs in the field of reactor safety sponsored by the Federal Ministry of Research and Technology: Reported period: January 1 to June 30, 1992.** Gesellschaft fuer Reaktorsicherheit mbH (GRS), Koeln (Germany); Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Mar 1993. 378p. (In German). Order Number DE94747614. Source: OSTI; NTIS (US Sales Only); INIS.

Each progress report represents a compilation of individual reports about objectives, the work performed, the results, the next steps of the work etc. The individual reports are prepared in a standard form by the contractors themselves as a documentation of their progress in work and published by the Forschungsbetreuung at the GRS, (FB) (Research Coordination Department), within the framework of general informations of progress in reactor safety research. The individual reports are classified according to the research program of the safety of LWR 1977-1980 of the BMFT. Another table uses the same classification system as applied in the nuclear safety index of the CEC (Commission of the European Communities) and the OECD (Organization for Economic Cooperation and Development). The reports are arranged in sequence of their project numbers. (orig./HP)

12264 (HW–71619-RD-Rev.1) **Nuclear health and safety technical specifications: Revision 1.** Gilbert, W.D. Hanford Works, Richland, WA (United States). 7 Dec 1961. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007889. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This information contained in this document is a compilation of technical specifications applicable to the process limits for the eight existing Hanford Production Reactors. These technical specifications, together with other administrative procedures and controls, would define the limits of reactor operation and would establish administrative methods for obtaining approvals, reviews, and procedures for making changes. Operating and performance restrictions are reported for: reactivity, reactor control and safety elements, power level, temperature and heat flux, reactor scram set points, reactor fuel loadings, reactor coolant system, reactor confinement, test facilities, and code compliance.

12265 (HW–78741) **Nuclear safety experience – Hanford production reactors.** Greager, O.H. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 27 Aug 1963. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007894. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Reactor operations at Hanford are to be conducted in the future under a new contract clause on nuclear health and safety, which sets up a form of AEC control somewhat akin to the licensing and regulatory function of the Commission with respect to commercial nuclear plants. As this transition in functional responsibilities approaches, it seems appropriate to review the record of more than 100 reactor-years of General Electric operation at Hanford, and to give an accounting of stewardship in regard to the all-important matter of nuclear safety in the production reactor operations. For the purposes of this review the events since General Electric assumed responsibility for plant operations in 1946 may be grouped into three periods. The first of these might be termed "The Early Years" and covers the period 1946 through 1952. During this time three additional reactors were placed on the line to supplement the original three war-built reactors. Power levels about doubled over the span, but there were relatively few changes from the original concepts of reactor design and operation, including the approach to reactor safeguards. A second period, 1953 through 1958, saw substantial advances in technology which led to new reactors, new loadings, and sharply increased productive capability. This period has been identified as "The Growing Problem," for it presented many challenges in meeting the need for uncompromising standards of nuclear safety while pioneering new areas of reactor operation. The final period of 1959 to the present could be called "High Level Operations;" production has been maximized during this period while achieving further progress in refinement of the philosophy and the practices in nuclear safety.

12266 (HW–80937) **Fission product formation in fuel elements.** Shields, R.J. Hanford Works, Richland, WA (United States). 19 Feb 1964. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007897. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. FUEL ELEMENTS/fission products; HANFORD PRODUCTION REACTORS/fuel elements; KRYPTON 85; IMPURITIES; REACTOR SAFETY

12267 (INIS-JP–016) **Present status of nuclear safety research in JAERI, 1993.** Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment. 1993. 104p. (In Japanese). Order Number DE94748658. Source: OSTI; NTIS; INIS.

The results of researches in JAERI (FY 1992) are summarized. In this report, following themes are collected: the safety analysis of reactor fuels, reliability of reactor equipments and structures, loss of coolant accidents (LOCA), reactor behaviors in case of severe accidents, reactor safety analysis, nuclear fuel facilities safety, radioactive waste processing and disposal, evaluation and analysis of environmental radiation and radioactivity, and so on. (J.P.N.).

12268 (JAERI-M–93-227) **Review on JMTR safety design for LEU core conversion.** Komori, Yoshihiro (Japan Atomic Energy Research Inst., Oarai, Ibaraki (Japan). Oarai Research Establishment); Yokokawa, Makoto; Saruta, Toru; Inada, Seiji; Sakurai, Fumio; Yamamoto, Katsumune; Oyamada, Rokuro; Saito, Minoru. Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1993. 79p. (In Japanese). Order Number DE94748672. Source: OSTI; NTIS; INIS.

Safety of the JMTR was fully reviewed for the core conversion to low enriched uranium fuel. Fundamental policies for the JMTR safety design were reconsidered based on the examination guide for safety design of test and research reactors, and safety of the JMTR was confirmed. This report describes the safety design of the JMTR from the viewpoint of major functions for reactor safety. (author).

12269 (Juel–2721) **Methods and data for HTGR fuel performance and radionuclide release modeling during normal operation and accidents for safety analysis.** Verfondern, K. (Forschungszentrum Juelich GmbH (Germany)); Martin, R.C.; Moormann, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik. Jan 1993. 169p. Order Number DE94752453. Source: OSTI; NTIS (US Sales Only); INIS.

The previous status report released in 1987 on reference data and calculation models for fission product transport in High-Temperature, Gas-Cooled Reactor (HTGR) safety analyses has been updated to reflect the current state of knowledge in the German HTGR program. The content of the status report has been expanded to include information from other national programs in HTGRs to provide comparative information on methods of analysis and the underlying database for fuel performance and fission product transport. The release and transport of fission products during

normal operating conditions and during the accident scenarios of core heatup, water and air ingress, and depressurization are discussed. (orig.)

12270 (KFK–5162) **Results of SEM microrange analyses of the PWR bundle meltdown experiment CORA-13.** Burbach, J. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Apr 1993. 107p. (In German). Order Number DE94752459. Source: OSTI; NTIS (US Sales Only); INIS.

The CORA experiments are evaluated on the basis of the values measured and video recordings during the experiment and by means of comprehensive destructive post-test examinations on microsections prepared from the overheated fuel rod bundle. This report is a presentation of the analytical results of microrange examinations on five transverse microsections of the CORA-13 fuel rod bundle using the scanning electron microscope (SEM). The CORA-13 experiment was selected by OECD/NEA as an international standard problem (ISP-31) for a comparison to be made among various computer codes elaborated to describe the destruction of the bundle. For this reason, the fuel rod bundle was subjected to intensive post-test examinations, including metallographic examinations as well as chemical analyses. (orig./HP)

12271 (LA-UR–94-121) **TRAC large-break loss-of-coolant accident analysis for the AP600 design.** Lime, J.F.; Boyack, B.E. Los Alamos National Lab., NM (United States). [1994]. 13p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940402–4: International topical meeting on the safety of advanced reactors, Pittsburgh, PA (United States), 18-20 Apr 1994). Order Number DE94006237. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses a TRAC model of the Westinghouse AP600 advanced reactor design which has been developed for analyzing large-break loss-of-coolant accident (LBLOCA) transients. A preliminary LBLOCA calculation of a 80% cold-leg break has been performed with TRAC-PF1/MOD2. The 80% break size was calculated by Westinghouse to be the most severe large-break size. The LBLOCA transient was calculated to 92 s. Peak clad temperatures (PCT) were well below the Appendix K limit of 1478 K (2200°F). Transient event times and PCT for the TRAC calculation were in reasonable agreement with those calculated by Westinghouse using their WCOBRA/TRAC code.

12272 (NUREG–1435-Suppl.3) **Status of safety issues at licensed power plants: TMI Action Plan requirements; unresolved safety issues; generic safety issues; other multiplant action issues: Supplement 3.** Nuclear Regulatory Commission, Washington, DC (United States). Program Management, Policy Development and Analysis Staff. Dec 1993. 170p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

As part of ongoing US Nuclear Regulatory Commission (NRC) efforts to ensure the quality and accountability of safety issue information, the NRC established a program for publishing an annual report on the status of licensee implementation and NRC verification of safety issues in major NRC requirements areas. This information was initially compiled and reported in three NUREG-series volumes. Volume 1, published in March 1991, addressed the status of Three Mile Island (TMI) Action Plan Requirements. Volume 2, published in May 1991, addressed the status of unresolved safety issues (USIs). Volume 3, published in June 1991, addressed the implementation and verification status of generic safety issues (GSIs). The first annual supplement, which combined these volumes into a single report and presented updated information as of September 30, 1991, was published in December 1991. The second annual supplement, which provided updated information as of September 30, 1992, was published in December 1992. Supplement 2 also provided the status of licensee implementation and NRC verification of other multiplant action (MPA) issues not related to TMI Action Plan requirements, USIs, or GSIs. This third annual NUREG report, Supplement 3, presents updated information as of September 30, 1993. This report gives a comprehensive description of the implementation and verification status of TMI Action Plan requirements, safety issues designated as USIs, GSIs, and other MPAs that have been resolved and involve implementation of an action or actions by licensees. This report makes the information available to other interested parties, including the public. Additionally, this report serves as a follow-on to NUREG-0933, "A Prioritization of Generic Safety Issues," which tracks safety issues until requirements are approved for imposition at licensed plants or until the NRC issues a request for action by licensees.

12273 (NUREG/CR–5812) **Managing aging in nuclear power plants: Insights from NRC maintenance team inspection reports.** Fresco, A. (Brookhaven National Lab., Upton, NY (United States)); Subudhi, M.; Gunther, W.; Grove, E.; Taylor, J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Brookhaven National Lab., Upton, NY (United States). Dec 1993. 187p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52309). Source: OSTI; NTIS; INIS; GPO.

A plant's maintenance program is the principal vehicle through which age-related degradation is managed. From 1988 to 1991, the NRC evaluated the maintenance program of every nuclear power plant in the United States. Forty-four out of a total of 67 of the reports issued on these in-depth team inspections were reviewed for insights into the strengths and weaknesses of the programs as related to the need to understand and manage the effects of aging on nuclear plant systems, structures, and components. Relevant information was extracted from these inspection reports and sorted into several categories, including Specific Aging Insights, Preventive Maintenance, Predictive Maintenance and Condition Monitoring, Post Maintenance Testing, Failure Trending, Root Cause Analysis and Usage of Probabilistic Risk Assessment in the Maintenance Process. Specific examples of inspection and monitoring techniques successfully used by utilities to detect degradation due to aging have been identified. The information also was sorted according to systems and components, including: Auxiliary Feedwater, Main Feedwater, High Pressure Injection for both BWRs and PWRs, Service Water, Instrument Air, and Emergency Diesel Generator Air Start Systems, and Emergency Diesel Generators Air Start Systems, emergency diesel generators, electrical components such as switchgear, breakers, relays, and motor control centers, motor operated valves and check valves. This information was compared to insights gained from the Nuclear Plant Aging Research (NPAR) Program. Attributes of plant maintenance programs where the NRC inspectors felt that improvement was needed to properly address the aging issue also are discussed.

12274 (NUREG/CR–5935) **Summary of work completed under the Environmental and Dynamic Equipment Qualification research program (EDQP).** Steele, R. Jr. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Bramwell, D.L.; Watkins, J.C.; DeWall, K.G. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1994. 76p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. (EGG–2686). Source: OSTI; NTIS; INIS; GPO.

This report documents the results of the main projects undertaken under the Environmental and Dynamic Equipment Qualification Research Program (EDQP) sponsored by the U.S. Nuclear Regulatory Commission (NRC) under FIN A6322. Lasting from fiscal year 1983 to 1987, the program dealt with environmental and dynamic (including seismic) equipment qualification issues for mechanical and electromechanical components and systems used in nuclear power plants. The research results have since been used by both the NRC and industry. The program included seven major research projects that addressed the following issues: (a) containment purge and vent valves performing under design basis loss of coolant accident loads, (b) containment piping penetrations and isolation valves performing under seismic loadings and design basis and severe accident containment wall displacements, (c) shaft seals for primary coolant pumps performing under station blackout conditions, (d) electrical cabinet internals responding to instructure generated motion (rattling), and (e) in situ piping and valves responding to seismic loadings. Another project investigating whether certain containment isolation valves will close under design basis conditions was also started under this program. This

report includes eight main section, each of which provides a brief description of one of the projects, a summary of the findings, and an overview of the application of the results. A bibliography lists the journal articles, papers, and reports that document the research.

12275 (NUREG/CR–6169) **Relay test program: Series 2 tests: Integral testing of relays and circuit breakers.** Bandyopadhyay, K.K. (Brookhaven National Lab., Upton, NY (United States)); Kunkel, C.; Shteyngart, S. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Brookhaven National Lab., Upton, NY (United States). Feb 1994. 162p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52406). Source: OSTI; NTIS; INIS; GPO.

This report presents the results of a relay test program conducted by Brookhaven National Laboratory (BNL) under the sponsorship of the US Nuclear Regulatory Commission (NRC). The program is a continuation of an earlier test program the results of which were published in NUREG/CR-4867. The current program was carried out in two phases: electrical testing and vibration testing. The objective was primarily to focus on the electrical discontinuity or continuity of relays and circuit breaker tripping mechanisms subjected to electrical pulses and vibration loads. The electrical testing was conducted by KEMA-Powertest Company and the vibration testing was performed at Wyle Laboratories, Huntsville, Alabama. This report discusses the test procedures, presents the test data, includes an analysis of the data and provides recommendations regarding reliable relay testing.

12276 (NUREG/GR–0008) **Validation of seismic probabilistic risk assessments of nuclear power plants.** Ellingwood, B. (Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Civil Engineering). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Johns Hopkins Univ., Baltimore, MD (United States). Dept. of Civil Engineering. Jan 1994. 131p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

A seismic probabilistic risk assessment (PRA) of a nuclear plant requires identification and information regarding the seismic hazard at the plant site, dominant accident sequences leading to core damage, and structure and equipment fragilities. Uncertainties are associated with each of these ingredients of a PRA. Sources of uncertainty due to seismic hazard and assumptions underlying the component fragility modeling may be significant contributors to uncertainty in estimates of core damage probability. Design and construction errors also may be important in some instances. When these uncertainties are propagated through the PRA, the frequency distribution of core damage probability may span three orders of magnitude or more. This large variability brings into question the credibility of PRA methods and the usefulness of insights to be gained from a PRA. The sensitivity of accident sequence probabilities and high-confidence, low probability of failure (HCLPF) plant fragilities to seismic hazard and fragility modeling assumptions was examined for three nuclear power plants. Mean accident sequence probabilities were found to be relatively insensitive (by a factor of two or less) to: uncertainty in the coefficient of variation (logarithmic standard deviation) describing inherent randomness in component fragility; truncation of lower tail of fragility; uncertainty in random (non-seismic) equipment failures (e.g., diesel generators); correlation between component capacities; and functional form of fragility family. On the other hand, the accident sequence probabilities, expressed in the form of a frequency distribution, are affected significantly by the seismic hazard modeling, including slopes of seismic hazard curves and likelihoods assigned to those curves.

12277 (NUREG/IA–0121) **Assessment of a pressurizer spray valve faulty opening transient at Asco Nuclear Power Plant with RELAP5/MOD2: International Agreement Report.** Reventos, F. (Asociacion Nuclear Asco, Barcelona (Spain)); Baptista, J.S.; Navas, A.P.; Moreno, P. Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research; Asociacion Nuclear Asco, Barcelona (Spain). Dec 1993. 54p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (ICSP–AS-SPR-R). Source: OSTI; NTIS; INIS; GPO.

Prepared as part of the Agreement on Research Participation and Technical Exchange under the International Thermal-Hydraulic Code Assessment and Application Program (ICAP).

The Asociacion Nuclear Asco has prepared a model of Asco NPP using RELAP5/MOD2. This model, which include thermalhydraulics, kinetics and protection and controls, has been qualified in previous calculations of several actual plant transients. One of the transients of the qualification process is a "Pressurizer spray valve faulty opening" presented in this report. It consists in a primary coolant depressurization that causes the reactor trip by overtemperature and later on the actuation of the safety injection. The results are in close agreement with plant data.

12278 **Fast-acting nuclear reactor control device.** Kotlyar, O.M.; West, P.B. To Dept. of Energy. 1992. U.S. patent application 7-841,109. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007343. Source: OSTI; NTIS; INIS; GPO Dep.

This invention consists of a fast-acting nuclear reactor control device for moving and positioning a safety control rod to desired elevations within the core of the reactor between a run position in which the safety control rod is outside the reactor core, and a shutdown position in which the rod is fully inserted in the reactor core. The device employs a hydraulic pump motor, an electric gear motor, and a solenoid valve to drive the safety control rod into the reactor core through the entire stroke of the safety control rod. An overrunning clutch, allows the safety control rod to freely travel toward a safe position in the event of a partial drive system failure.

12279 (SAND–92-1506) **Model for heat-up of structures in VICTORIA.** Bixler, N.E. Sandia National Labs., Albuquerque, NM (United States). Dec 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008109. Source: OSTI; NTIS; INIS; GPO Dep.

VICTORIA is a mechanistic computer code that treats fission product behavior in the reactor coolant system during a severe accident. During an accident, fission products that deposit on structural surfaces produce heat loads that can cause fission products to revaporize and possibly cause structures, such as a pipe, to fail. This mechanism had been lacking from the VICTORIA model. This report describes the structural heat-up model that has recently been implemented in the code. A sample problem shows that revaporization of fission products can occur as structures heat up due to radioactive decay. In the sample problem, the mass of deposited fission products reaches a maximum, then diminishes. Similarly, temperatures of the deposited film and adjoining structure reach a maximum, then diminish.

12280 (SAND–93-1888, pp. 111-124) **Decontamination and dismantlement.** Hamel, W.R. (ORNL, Oak Ridge, TN (United States)). Sandia National Labs., Albuquerque, NM (United States). Oct 1993. (CONF-9307149–Vugraphs: 4. DOE Industry/University/Lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 19-21 Jul 1993). In *Vugraph presentations of the fourth DOE Industry/University/Lab Forum on Robotics for Environmental Restoration and Waste Management.* 170p. Order Number DE94002610. Source: OSTI; NTIS.

The vugraphs for the presentation on Decontamination and dismantlement include: a title board; Budget and team members; Outline; D & D Robotics will impact key steps of the overall D & D sequence; D & D Robotics planning shows requirements ranging over several orders of magnitude; New Focus: Reduce risk and cost in the surveillance & maintenance (S & M) phase; FY94 Major thrusts address D & D surveillance and maintenance needs; D & D Robotics summary.

12281 (SAND–93-2124C) **Integrated safety program for the Nuclear Electric Propulsion Space Test Program.** Marshall, A.C. (Sandia National Labs., Albuquerque, NM (United States)); Mehlman, W.F.; Kompanietz, G. Sandia National Labs., Albuquerque, NM (United States). [1993]. 10p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940101–29: 11. symposium on space nuclear power systems, Albuquerque, NM (United States),

9-13 Jan 1994). Order Number DE94004670. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Nuclear Electric Propulsion Space Test Program (NEPSTP) is sponsored by the Ballistic Missile Defense Office (BMDO) to demonstrate and evaluate the Russian-built TOPAZ II nuclear reactor as a power source for an electric propulsion system in space. From its inception, safety has been a central feature of the NEPSTP program. This paper addresses the work done to define the safety organizational relationships, responsibilities, management, engineering requirements, and documentation to assure an integrated safety program that coordinates the various safety activities in Mission Safety, Range Safety and Nuclear Safety. Because the United States has not launched a nuclear reactor since 1965, much of the focus of the safety program has been directed toward the unique safety considerations of using a nuclear reactor in space. Our preliminary findings indicate that the safe use of the TOPAZ II for the NEPSTP space mission is feasible.

12282 (UCRL-JC–114806) **Class 1E software verification and validation: Past, present, and future.** Persons, W.L.; Lawrence, J.D. Lawrence Livermore National Lab., CA (United States). Oct 1993. 39p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931079–18: Water reactor safety information meeting, Bethesda, MD (United States), 25-27 Oct 1993). Order Number DE94007382. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses work in progress that addresses software verification and validation (V&V) as it takes place during the full software life cycle of safety-critical software. The paper begins with a brief overview of the task description and discussion of the historical evolution of software V&V. A new perspective is presented which shows the entire verification and validation process from the viewpoints of a software developer, product assurance engineer, independent V&V auditor, and government regulator. An account of the experience of the field test of the Verification Audit Plan and Report generated from the V&V Guidelines is presented along with sample checklists and lessons learned from the verification audit experience. Then, an approach to automating the V&V Guidelines is introduced. The paper concludes with a glossary and bibliography.

12283 (WHC-SA–2121) **Analyses of postulated ALMR containment and steam generator building accidents using the CONTAIN-LMR code.** Chiao, T. (Westinghouse Hanford Co., Richland, WA (United States)); Wood, S.A.; Shen, P.K.; Baker, R.B.; Gluekler, E.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940402–3: International topical meeting on the safety of advanced reactors, Pittsburgh, PA (United States), 18-20 Apr 1994). Order Number DE94005490. Source: OSTI; NTIS; INIS; GPO Dep.

The development of liquid metal reactor concepts with passive safety characteristics is in progress at the General Electric Company under contract to the US Department of Energy. To assess the performance of these systems under postulated severe accident conditions analyses of containment accidents relating to the breach of the primary coolant boundary of the Department of Energy Advanced Liquid Metal Reactor were completed by Westinghouse Hanford Company for the plant designer General Electric. A series of three accident cases were selected by General Electric for characterizing the containment responding to a hypothetical core disruptive accident. In addition, the Advanced Liquid Metal Reactor Steam Generator Building was also analyzed to demonstrate the acceptability of the Steam Generator Building sodium fire protection strategy related to a design-basis leak.

24 POWER TRANSMISSION AND DISTRIBUTION

12284 (DOE/BP–1975) **Research and development report, Fiscal year 1991 and 1992.** USDOE Bonneville Power Administration, Portland, OR (United States). Sep 1993. 71p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94005632. Source: OSTI; NTIS; GPO Dep.

This report details research and development activities for the fiscal years of 1991 and 1992.

2401 Power Systems

12285 (CONF-9311149–Summ.) **[Draft minutes of IAPG Mechanical Working Group meeting].** Skinner, D.M. Horizon Data Corp., Reston, VA (United States). Power Information Center. 15 Dec 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-90CE90053. From Interagency Advanced Power Group (IAPG) mechanical meeting; Albuquerque, NM (United States); 3-4 Nov 1993. Order Number DE94004954. Source: OSTI; NTIS; GPO Dep.

This report provides the draft minutes of the Interagency Advanced Power Group meeting held November 3–4, 1993. Topics addressed are: Materials for thermal management; photovoltaic programs in the Airforce; ground based radar advanced power system development program; battery research; generator prognostics & diagnostics equipment; a thermal flight experiment test program; power systems assessment; Overview: Phillip's space thermal technologies branch; and development of actuator thermal management.

2402 Power System Networks, Transmission and Distribution

12286 (NEI-NO–388) **Internal faults in oil-filled distribution transformers: Fault mechanisms and choice of protection.** Roenningen, T. Trondheim Univ. (Norway). Norges Tekniske Hoegskole. Jun 1993. 197p. Order Number DE94743507. Source: OSTI; NTIS.

The aim of this work has been to study internal faults in mineral-oil-filled distribution transformers. In this work, main emphasis is placed on experimental work, both on full scale and model transformers. The service experience and fault statistics of distribution transformers situated in cable networks show that the failure rate of these transformers is less than one fault per thousand transformer years. Because of the low failure rate, the main argument for the overcurrent and fault-current protection of distribution transformers situated in cable networks is to ensure the safety of the general public and operating personnel by protecting against explosions or violent transformer tank rupture. Tests with internal short circuits between turns carried out in this work, and tests described in the literature have both shown that the line currents may reach values which sometimes may be detected by overcurrent relays or correctly dimensioned current limiting fuses. Consequently, adequate overcurrent protection against the most common type of internal faults in distribution transformers can not be achieved, neither with the implementation with primary circuit breaker and commercial overcurrent relays, nor with the fuse-loadbreaker combination. Tests with internal short circuits between turns have shown that gas-actuated Buchholz relays operate very satisfactorily and fast both for transformers with conservator and for hermetically-sealed transformers. Used together with a primary circuit breaker and a correct dimensioned overcurrent relay or a fuse-loadbreaker combination, the gas actuated relay seems to be the best safety arrangement for the most common type of fault in distribution transformers, namely short circuits between neighbouring turns or layers in the medium voltage winding. 109 refs., 69 figs., 42 tabs.

12287 (SAND–93-1724C) **System requirements for laser power beaming to geosynchronous satellites.** Neal, R.D. (Martin Marietta, Denver, CO (United States)); McKechnie, T.S.; Neal, D.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940142–20: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007731. Source: OSTI; NTIS; GPO Dep.

Geosynchronous satellites use solar arrays as their primary source of electrical power. During earth eclipse, which occurs 90

times each year, the satellites are powered by batteries, but the heavy charge-discharge cycle decreases their life expectancy. By beaming laser power to satellites during the eclipses, satellite life expectancy can be significantly increased. In this paper, the authors investigate the basic system parameters and trade-offs of using reactor pumped laser technology to beam power from the Nevada Test Site. A first order argument is used to develop a consistent set of requirements for such a system.

2404 Health and Safety

Refer also to citation(s) 12288

2405 Environmental Aspects

Refer also to citation(s) 12289

12288 (DOE/BP–2256) **Coyote Springs Cogeneration Project, Morrow County, Oregon: Draft Environmental Impact Statement.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1994. 263p. Sponsored by USDOE, Washington, DC (United States). (DOE/DEIS–0201). Order Number DE94007591. Source: OSTI; NTIS; GPO Dep.

BPA is considering whether to transfer (wheel) electrical power from a proposed privately-owned, combustion-turbine electrical generation plant in Oregon. The plant would be fired by natural gas and would use combined-cycle technology to generate up to 440 average megawatts (aMW) of energy. The plant would be developed, owned, and operated by Portland General Electric Company (PGE). The project would be built in eastern Oregon, just east of the City of Boardman in Morrow County. The proposed plant would be built on a site within the Port of Morrow Industrial Park. The proposed use for the site is consistent with the County land use plan. Building the transmission line needed to interconnect the power plant to BPA's transmission system would require a variance from Morrow County. BPA would transfer power from the plant to its McNary-Slatt 500-kV transmission line. PGE would pay BPA for wheeling services. Key environmental concerns identified in the scoping process and evaluated in the draft Environmental Impact Statement (DEIS) include these potential impacts: (1) air quality impacts, such as emissions and their contributions to the "greenhouse" effect; (2) health and safety impacts, such as effects of electric and magnetic fields, (3) noise impacts, (4) farmland impacts, (5) water vapor impacts to transportation, (6) economic development and employment impacts, (7) visual impacts, (8) consistency with local comprehensive plans, and (9) water quality and supply impacts, such as the amount of wastewater discharged, and the source and amount of water required to operate the plant. These and other issues are discussed in the DEIS. The proposed project includes features designed to reduce environmental impacts. Based on studies completed for the DEIS, adverse environmental impacts associated with the proposed project were identified, and no evidence emerged to suggest that the proposed action is controversial.

2406 Legislation and Regulations

Refer also to citation(s) 12345

12289 (ANL/EAD/TM–3) **Transmission line environmental assessment guidance document.** Jackson, J.; Pentecost, E.; Muzzarelli, J. Argonne National Lab., IL (United States). Jan 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007462. Source: OSTI; NTIS; GPO Dep.

Since 1939, U.S. utility companies have been required to obtain a Presidential Permit to construct electric transmission lines that cross a U.S. border and connect with a foreign utility. The purpose of this document is to provide Presidential Permit applicants with two types of guidance: (1) on the type of environmental and project descriptive information needed to assess the potential impacts of the proposed and alternative actions and (2) on compliance with applicable federal and state regulations. The main three chapters present information on the purpose and content of this document (Chapter 1); legislative, regulatory, and consultation requirements for transmission line interconnect projects (Chapter 2); and identification of basic transmission system design parameters and environmental data requirements for analysis of potential impacts of the proposed action (Chapter 3). Chapter 3 also includes information on possible techniques or measures to mitigate impacts. Appendix A presents an overview of NEPA requirements and DOE's implementing procedures. Appendix B summarizes information on legislation that may be applicable to transmission line projects proposed in Presidential Permit applications.

2407 Economic, Industrial, and Business Aspects

Refer also to citation(s) 12341

25 ENERGY STORAGE

Refer also to citation(s) 12347

2505 Flywheels

12290 (CONF-9311155–) **Flywheel Energy Storage technology workshop.** O'Kain, D.; Howell, D. (comps.). Oak Ridge National Lab., TN (United States). [1993]. 453p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Fly wheel energy storage technology workshop; Oak Ridge, TN (United States); 2-4 Nov 1993. Order Number DE94008064. Source: OSTI; NTIS; GPO Dep.

Advances in recent years of high strength/lightweight materials, high performance magnetic bearings, and power electronics technology has spurred a renewed interest by the transportation, utility, and manufacturing industries in Flywheel Energy Storage (FES) technologies. FES offers several advantages over conventional electro-chemical energy storage, such as high specific energy and specific power, fast charging time, long service life, high turnaround efficiency (energy out/energy in), and no hazardous/toxic materials or chemicals are involved. Potential applications of FES units include power supplies for hybrid and electric vehicles, electric vehicle charging stations, space systems, and pulsed power devices. Also, FES units can be used for utility load leveling, uninterruptable power supplies to protect electronic equipment and electrical machinery, and for intermittent wind or photovoltaic energy sources. The purpose of this workshop is to provide a forum to highlight technologies that offer a high potential to increase the performance of FES systems and to discuss potential solutions to overcome present FES application barriers. This document consists of viewgraphs from 27 presentations.

2506 Thermal

Refer also to citation(s) 12429, 13016

12291 (DOE/FTR–94002461) **Travel to the Netherlands to participate in the IEA Annex VI Experts Meeting: Foreign trip report, September 18, 1993–October 2, 1993.** Jenne, E.A. Pacific Northwest Lab., Richland, WA (United States). 27 Oct 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94002461. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The IEA Annex VI meetings bring together international experience in seasonal thermal (primarily aquifer) energy storage (STES) research, which is of significant value to US energy conservation and peak load shaving. The US has played an important role in this annex, with contributions involving aeochemical modeling, laboratory and field studies of geochemical and microbiologic behavior, and formulation of tools to aid in evaluation of water treatment for STES systems. Results obtained and shared by our European counterparts are substantial and can significantly aid economic development of STES in the US. The US can make significant use of the data obtained in this Annex from The Netherlands, Sweden, and Germany to extend the results of US research (i.e., laboratory experimentation, modeling, St. Paul field data) to the development of new STES sites in the US.

2509 Batteries

Refer also to citation(s) 12034, 12285, 12455

12292 (ANL/CMT/PROC–81920) **Proceedings of the AD HOC Workshop on Ceramics for Li/FeS_2 batteries.** Argonne National Lab., IL (United States). [1993]. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9309203–: Ad-hoc workshop on ceramics for LI/SEs2 batteries, Oak Brook, IL (United States), 29-30 Sep 1993). Order Number DE94007460. Source: OSTI; NTIS; GPO Dep.

Representatives from industry, the U.S. Advanced Battery Consortium (USABC), DOE, national laboratories, and other govt agencies met to develop recommendations and actions for accelerating the development of ceramic components critical to the successful introduction of the Li/FeS_2 bipolar battery for electric vehicles. Most of the workshop is devoted to electrode materials, bipolar designs, separators, and bipolar plates. The bulk of this document is viewographs and is divided into: ceramics, USABC overview, SAFT's Li/FeS_2 USABC program, bipolar Li/FeS_2 component development, design requirements for bipolar plates, separator design requirements, compatibility of ceramic insulators with lithium, characterization of MgO for use in separators, resistivity measurements of separators, sintered AlN separators for LiMS batteries, etc.

12293 (BNL–60038) **The zinc electrode: Reactions and mechanisms.** McBreen, J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States); North Carolina State Univ., Raleigh, NC (United States). Dept. of Physics. [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG05-89ER45384. (CONF-9311115–2: Symposium on science of advanced batteries, Cleveland, OH (United States), 8-9 Nov 1993). Order Number DE94007977. Source: OSTI; NTIS; GPO Dep.

The zinc electrode in alkaline electrolyte is unusual in that supersaturated zincate solutions can form during discharge and spongy or mossy zinc deposits can form on charge at low overvoltages. This paper reports on in situ x-ray absorption (XAS) results on supersaturated zincate and on mossy deposits.

12294 (SAND–94-0380C) **Design considerations in LI/$SOCl_2$ battery technology.** Cieslak, W.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940568–1: 7. international meeting on lithium batteries, Cambridge, MA (United States), 15-20 May 1994). Order Number DE94006582. Source: OSTI; NTIS; GPO Dep.

Li/$SOCl_2$ battery technology is attractive by virtue of its high energy density, low self-discharge rate, and ability to to perform well at a wide variety of discharge rates. However, some of these same attributes also make Li/$SOCl_2$ cells capable of hightly exothermic events when handled under abnormal conditions. We manage the energy safely and optimize the performance by tailoring the design to the application. We have developed three different "D" size cells that target low, moderate, and high rate applications. Each design provides safe and efficient performance, although, in progressing from low to high rate capability, the likelihood of venting under abuse conditions increses. We incorporate a vent mechanism in all designs as the ultimate protection from severe abuse. The details of our battery designs and the benefits of application-specific design are discussed.

29 ENERGY PLANNING AND POLICY

12295 (PNL-SA–22929) **Findings of an evaluation of public involvement programs associated with the development of a Land and Resource Management Plan for the Ouachita National Forest.** Holthoff, M.G. (Pacific Northwest Lab., Richland, WA (United States)); Howell, R.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 33p. Sponsored by Department of Agriculture, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308196–1: Interagency symposium on property rights, Orlando, FL (United States), 7 Aug 1993). Order Number DE94004311. Source: OSTI; NTIS; GPO Dep.

Federal regulations require the United States Forest Service (USFS) to integrate public input and values into decisions concerning land and resource management planning. The USFS has typically relied on traditional methods of involving the public, whereby public access and input to policy development are unilaterally controlled by the agency. Because of the highly political nature of land and resource management planning, such technocratic forms of public involvement and decision-making appear to be proving ineffective. This paper describes and evaluates two public involvement programs associated with the Ouachita National Forest's (ONF) lengthy forest planning process. The research consisted of personal interviews with key program leaders and knowledgeable citizen participants, collection of secondary data, and a survey of citizen participants. Because of controversial planning decisions made during an initial planning process, the ONF was forced to re-enter the planning process in order to address unresolved planning issues and to conduct a more effective public involvement program. The supplemental planning process also resulted in a considerable degree of public contention. The survey revealed that although citizen participants were somewhat more satisfied with the supplemental public involvement program relative to the initial program, neither program was viewed as satisfactory. The findings of the study suggest that in order to be more effective, USFS public involvement programs should be more responsive to public concerns and conducted in adherence to principles of collaborative planning.

2901 Energy Analysis and Modeling

12296 (DOE/EIA–0566) **Proceedings of the National Energy Modeling System Conference.** USDOE Energy Information Administration, Washington, DC (United States). Office of Integrated Analysis and Forecasting. 28 May 1993. 1027p. Sponsored by USDOE, Washington, DC (United States). (CONF-930223–: National energy modeling system users' conference, Arlington, VA (United States), 1-2 Feb 1993). Order Number DE94008256. Source: OSTI; NTIS; GPO Dep.

Purpose of the conference was to give potential users of the National Energy Modeling System (NEMS), under development in the Energy Information Administration, a detailed look at its components, and to provide an opportunity for critical analysis of the system by experts in the modeling field and input about how the system can best address the users' needs. During the conference, 43 reviewers participated in panel discussions of the components of NEMS: oil and gas supply, buildings demand, macroeconomics (national module panel), macroeconomics (interindustry and regional module panel), gas transmission and distribution, renewable fuels, international oil, industrial demand, electricity planning, refineries and petroleum markets, electricity operations, system integration and user interfaces, transportation demand, coal supply and synthetics, and electricity finance and pricing.

2902 Economics and Sociology

Refer also to citation(s) 11754, 11800, 11857, 12301, 12331, 12339, 12342, 12414, 12445, 12664, 14279

12297 (ANL/EAIS/PP–77719) **Race, ethnicity, and noxious facilities: Environmental racism re- examined.** Nieves, A.L. (Wheaton Coll., IL (United States)); Nieves, L.A. Argonne National Lab., IL (United States). Oct 1992. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008116. Source: OSTI; NTIS; GPO Dep.

The charge has been made that hazardous facilities tend to be located in proximity to minority populations. This study uses a facility density measure for three categories of noxious facilities to examine the relationship between facilities and minority population concentrations. County-level data are used in a correlation analysis for African Americans, Hispanics, and Asians in the four major regions of the US. Even controlling for income and housing value, and limiting the data set to urban areas, consistent patterns of moderate to strong association of facility densities with minority population percentages are found.

12298 (DOE/MI/10270–T1) **Establishing the SECME Model in the District of Columbia: Quarterly report, September 1, 1993–December 31, 1993.** Southeastern Consortium for Minorities in Engineering, Atlanta, GA (United States). [1993]. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93MI10270. Order Number DE94006983. Source: OSTI; NTIS; GPO Dep.

Technical progress and Federal Cash Transaction reports are presented for the first quarter. The work has been valuable in providing opportunities for greater academic achievement in mathematics and science for minority students in the District of Columbia.

12299 (DOE/SR/15199–6) **Annual review of cultural resource investigations by the Savannah River Archaeological Research Program: Fiscal year 1993.** South Carolina Univ., Columbia, SC (United States). Savannah River Archaeological Research Program. Oct 1993. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC09-88SR15199. Order Number DE94005337. Source: OSTI; NTIS; GPO Dep.

A cooperative agreement with the United States Department of Energy provides the necessary funding for the Savannah River Archaeological Research Program (SRARP) of the South Carolina Institute of Archaeology and Anthropology, University of South Carolina, to render services required under federal law for the protection and management of archaeological resources on the Savannah River Site (SRS). Because the significance of archaeological resources is usually determined by research potential, the SRARP is guided by research objectives. An ongoing research program provides the theoretical, methodological, and empirical basis for assessing site significance within the compliance process specified by law. In accordance with the spirit of the law, the SRARP maintains an active public education program for disseminating knowledge about prehistory and history, and for enhancing awareness of historic preservation. This report summarizes the management, research, and public education activities of the SRARP during Fiscal Year 1993.

12300 (NUREG–1100-Vol.10) **Budget estimates fiscal year 1995: Volume 10.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Budget and Analysis. Feb 1994. 205p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; GPO; INIS.

This report contains the Nuclear Regulatory Commission (NRC) fiscal year budget justification to Congress. The budget provides estimates for salaries and expenses and for the Office of the Inspector General for fiscal year 1995. The NRC 1995 budget request is $546,497,000. This is an increase of $11,497,000 above the proposed level for FY 1994. The NRC FY 1995 budget request is 3,218 FTEs. This is a decrease of 75 FTEs below the 1994 proposed level.

2903 Environment, Health, and Safety

Refer also to citation(s) 11580, 11673, 11674, 11675, 11690, 11691, 11773, 11804, 11830, 11846, 11882, 12297, 12336, 12443, 13031, 13033

12301 (DOE/BP–2285) **Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Volume 2: Public involvement.** USDOE Bonneville Power Administration, Portland, OR (United States). Jan 1994. 232p. Sponsored by USDOE, Washington, DC (United States). (DOE/EIS–0194-Vol.2). Order Number DE94007594. Source: OSTI; NTIS; GPO Dep.

In regard to the proposed Tenaska Washington II Generation Project, the goal of the Bonneville Power Administration's (BPA) Environmental Impact Statement (EIS) public involvement process is to determine the issues to be examined and pertinent analyses to be conducted and to solicit comments on the content and quality of information presented in the Draft Environmental Impact Statement (DEIS). Comments and questions are solicited from the public and government agencies during the scoping process and during the comment period and public hearing on the DEIS, to find out what is of most concern to them. The end product of the public involvement process is the Comment Report which follows in part of this volume on Public Involvement.

12302 (DOE/EH–231-021/0293) **RCRA post-closure permits: RCRA Information Brief.** Coalgate, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Feb 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008213. Source: OSTI; NTIS; GPO Dep.

The Resource Conservation and Recovery Act (RCRA) requires that hazardous waste management facilities operate in accordance with permits granted by the US Environmental Protection Agency (EPA) or a State authorized to carry out the RCRA Subtitle C program. Several categories of permits, including treatment,storage, and disposal permits; research, development and demonstration permits; post-closure permits; emergency permits; permits-by-rule; and trial burn and land treatment demonstration permits are issued under the RCRA Subtitle C program. This Information Brief focuses on post-closure permitting requirements under 40 CFR 270.1(c).

12303 (DOE/EH–231-022/0793) **RCRA corrective action permit requirements and modifications under Subpart F regulations: RCRA Information Brief.** Coalgate, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jul 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008210. Source: OSTI; NTIS; GPO Dep.

The ground water protection requirements under the Resource Conservation and Recovery Act (RCRA), 40 CFR 264, Subpart F, apply to surface impoundments, waste plies, land treatment units, and landfills that received hazardous waste after July 26,1982 (i.e., regulated units). There are three phases to the Subpart F ground water protection requirements: detection monitoring, compliance monitoring, and corrective action. Subpart F corrective action applies to remediation of ground water contamination resulting from releases from regulated units at a treatment, storage, or disposal facility (TSDF). The TSDF owner or operator is responsible for complying with these requirements. This Information Brief provides information on the permit requirements under Subpart F. This Information Brief is one of a series on RCRA corrective action. The first step in the permitting process is for the facility to determine the need for ground-water monitoring. The regulations found in 40 CFR 264 Sections 264.90 to 264.100 (Subpart F) apply to all regulated units. A "regulated unit" is defined as a surface impoundment, waste pile, landfill, or land treatment unit that received hazardous waste after July 26, 1982. Such units require a permit under RCRA. Subpart F entails a three-phased program designed to detect, evaluate, and, if necessary, respond to ground water contamination. The ground-water protection standard, including identification of maximum contaminant levels (MCLs) under the Safe Drinking Water Act (SDWA) and alternate concentration limits (ACLs), is established with the permit application. Where MCLs and ACLs cannot be established, the standard may be established at background levels.

12304 (DOE/EH–231-022/1193) **RCRA and CERCLA requirements associated with the sale or transfer of DOE property: CERCLA Information Brief.** Whitehead, B. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Nov 1993. 3p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008202. Source: OSTI; NTIS; GPO Dep.

This information brief summarizes the RCRA (Resource Conservation and Recovery Act) and CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) statutory and regulatory requirements pertinent to sale or transfer of DOE property. The regulations pertain to hazardous waste or radioactive mixed waste disposal.

12305 (DOE/EH–231-023/0793) **RCRA corrective action permit requirements and modifications under proposed Subpart S rule: RCRA Information Brief.** Coalgate, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jul 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008208. Source: OSTI; NTIS; GPO Dep.

Corrective action is required under the authority of the Resource Conservation and Recovery Act (RCRA) Sections 3004(u) and(v) which were added by the Hazardous and Solid Waste Amendments of 1984 (HSWA). In response to HSWA, the US Environmental Protection Agency(EPA) proposed a comprehensive corrective action program under 40 CFR 264 Subpart S [55 FR 30798, July 27, 1990]. Although Subpart S is still only proposed, it is being implemented by the EPA Regions until the rule is finalized. Proposed Subpart S corrective action applies to releases to any media from any solid waste management unit (SWMU) at a treatment, storage, or disposal facility (TSDF). Corrective action requirements under proposed Subpart S are imposed through permit conditions or, for interim status facilities, through a RCRA Section 3008(h) order. In general, upon initial regulation of a TSDF, the owner or operator submits a Part A permit application, notifying the regulatory agency of waste management activities. The Part A consists of a form containing general information about the facility, the unit(s) affected, and the wastes managed in the units. Part B of the permit application provides detailed information on the facility, the units affected, and the waste managed. The Part B permit application may consist of several volumes of information. Proposed Subpart S requirements, would be contained in the Part B permit application. The Part B permit application proposes requirements and conditions intended to respond to the various RCRA requirements for permitted units. This submittal initiates the negotiation process for regulated SWMUS, whereby the requirements and conditions for unit operation are established. The term of the permit is typically 5 or 10 years, after which a permit renewal or issuance of a new permit is required. This Information Brief provides information on the permit requirements and process under proposed Subpart S.

12306 (DOE/EH–231-034/0593) **Exclusions and exemptions from RCRA hazardous waste regulation: RCRA Information Brief.** Powers, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. May 1993. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008212. Source: OSTI; NTIS; GPO Dep.

The provisions in 40 CFR 261 establish which solid waste and are regulated under Subtitle C of the Resource Considered hazardous waste and are regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA). These provisions also exclude or exempt certain wastes from regulation. Wastes are excluded or exempted from coverage for a variety of reasons. The original RCRA legislation excluded a number of wastes that did not present a significant threat to human health or the environment or that were managed under other environmental programs. Other wastes were excluded by EPA to encourage their recycling or reuse as feedstocks in manufacturing processes. Some exclusions or exemptions serve to establish when a waste material becomes subject to regulation or when waste quantities are too minimal to be fully covered by the Federal hazardous waste regulatory program. As new regulations have caused the universe of RCRA generators and facilities to increase, the number of exclusions and exemptions have increased as well. This information Brief provides an overview of the types of waste and hazardous waste management units/facilities that may be excluded or exempted from regulation under the Federal hazardous waste (RCRA) Subtitle C) regulatory program. These wastes and units/facilities may or may not be excluded or exempted from coverage under authorized State RCRA programs.

12307 (DOE/EH–231-035/0693) **The "Derived-from" rule under the Resource Conservation and Recovery Act (RCRA): RCRA Information Brief.** Petts, M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jun 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008211. Source: OSTI; NTIS; GPO Dep.

Under the "Derived-from" rule, solid waste that is generated from the treatment, storage or disposal of a hazardous waste is itself classified as a hazardous waste. Therefore, residues resulting from treatment, storage or disposal activities including materials such as sludges, ash emission control dusts, leachate, or spill residues are considered hazardous wastes (with certain exceptions discussed below). This provision is based on the premise that any residues from treatment, storage or disposal of hazardous waste will contain hazardous constituents [40 CFR 261.3(c)(2)(i)]. It should be noted that a December, 1991 court ruling remanded both the "Mixture" rule (see ref. 1) and the "Derived-from" rule to the Environmental Protection Agency (EPA), on the grounds that EPA did not allow for public comment on these rules prior to promulgation. On March 3, 1992 EPA reinstated the rules on an interim basis, and is currently developing a revised regulatory scheme for hazardous waste classification (see ref. 2).

12308 (DOE/EH–231-039/1193) **Ground-water monitoring under RCRA: RCRA Information Brief.** Coalgate, J. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Nov 1993. 4p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008204. Source: OSTI; NTIS; INIS; GPO Dep.

In developing a regulatory strategy for the disposal of hazardous waste under the Resource Conservation and Recovery Act (RCRA), protection of ground-water resources was the primary goal of the Environmental Protection Agency (EPA). EPA's groundwater protection strategy seeks to minimize the potential for hazardous wastes and hazardous constituents in waste placed in land disposel units to migrate into the environment. This is achieved through liquids management (limiting the placement of liquid wastes in or on the land, requiring the use of liners beneath waste, installing leachate collection systems and run-on and run-off controls, and covering wastes at closure). Ground-water monitoring serves to detect any failure in EPA's liquids management strategy so that ground-water contamination can be detected and addressed as soon as possible.

12309 (DOE/EH–231-0181/0992) **Loss of interim status (LOIS) under RCRA.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. Sep 1992. 3p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008195. Source: OSTI; NTIS; GPO Dep.

The Resource Conservation and Recovery Act (RCRA) requires owners and operators of facilities that treat, store, or dispose of hazardous waste (TSDFs) to obtain an operating permit. Recognizing that it would take EPA many years to issue operating permits to all RCRA facilities, Congress created "interim status" under Section 3005(e) of the Act. Interim status allows facilities to operating permits to all RCRA facilities to operate under Subtitle C of RCRA until their permits are issued or denied. This information brief defines interim status and describes how failure to meet interim status requirements may lead to loss of interim status (LOIS).

12310 (DOE/EH–94007658) **Remedial Investigation/ Feasibility Study (RI/FS) process, elements and techniques guidance.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Dec 1993. 728p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007658. Source: OSTI; NTIS; GPO Dep.

This manual provides detailed guidance on Remedial Investigation/Feasibility Studies (RI/FSs) conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at Department of Energy (DOE) facilities. The purpose of the RI/FS, to assess the risk posed by a hazardous waste site and to determine the best way to reduce that risk, and its structure (site characterization, risk assessment, screening and detailed analysis of alternatives, etc.) is defined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and further explained in the Environmental Protection Agency's (EPA's) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final) 540/G-89/004, OSWER Directive 9355.3-01, October 1988. Though issued in 1988, the EPA guidance remains an excellent source of information on the conduct and structure of an RI/FS. This document makes use of supplemental RI/FS-related guidance that EPA has developed since its initial document was issued in 1988, incorporates practical lessons learned in more than 12 years of experience in CERCLA hazardous site remediation, and drawing on those lessons, introduces the Streamlined Approach For Environmental Restoration

(SAFER), developed by DOE as a way to proceed quickly and efficiently through the RI/FS process at DOE facilities. Thus as its title implies, this guidance is intended to describe in detail the process and component elements of an RI/FS, as well as techniques to manage the RI/FS effectively.

12311 (DOE/EIS–0200) **Implementation Plan: Environmental Restoration and Waste Management Programmatic Environmental Impact Statement.** USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Office of Environmental Restoration. Jan 1994. 279p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007924. Source: OSTI; NTIS; GPO Dep.

In accordance with the Department of Energy's National Environmental Policy Act implementing procedures in Volume 10 of the Code of Federal Regulations, Section 1021,312, the Environmental Restoration and Waste Management Programmatic Environmental Impact Statement Implementation Plan has two primary purposes: to provide guidance for the preparation of the Programmatic Environmental Impact Statement and to record the issues resulting from the scoping and the extended public participation process. The Implementation Plan identifies and discusses the following: background of Environmental Restoration and Waste Management activities, the purpose of the Programmatic Environmental Impact Statement, and the relationship of the Programmatic Environmental Impact Statement to other Departmental initiatives (Chapter 1); need and purposes for action (Chapter 2); scoping process and results of the public participation program in defining the scope of the Programmatic Environmental Impact Statement, including a summary of the comments received and their disposition (Chapter 3); planned scope and content of the Programmatic Environmental Impact Statement (Chapter 4); consultations with other agencies and the role of cooperating agencies (Chapter 5); planned schedule of major Programmatic Environmental Impact Statement milestones (Chapter 6); and responsibilities for preparation of the Programmatic Environmental Impact Statement (Chapter 7).

12312 (DOE/EIS–0200-Exec.Summ.) **Implementation plan: Executive summary: Environmental restoration and waste management programmatic environmental impact statement.** USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007233. Source: OSTI; NTIS; GPO Dep.

In November 1989, the Secretary of Energy established the U.S. Department of Energy Office of Environmental Restoration and Waste Management. This action consolidated the Department's environmental restoration and waste management activities throughout the nation. In January 1990, the Secretary of Energy decided that the Department would prepare a Programmatic Environmental Impact Statement on the proposed integrated Environmental Restoration and Waste Management Program. The principal focus of the Programmatic Environmental Impact Statement process will be the evaluation of strategies for conducting remediation of Department sites and facilities to ensure the protection of human health and the environment; and the evaluation of potential configurations for waste management capabilities.

12313 (DOE/ER/75666–1) **South Carolina DOE/EPSCoR energy-related research development grant: Final report addendum, 30 September, 1992–29 March, 1993.** Durig, J.R. South Carolina Univ., Columbia, SC (United States). Aug 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER75666. Order Number DE94008089. Source: OSTI; NTIS; GPO Dep.

The South Carolina DOE/EPSCoR Energy Related Research Development Grant was used to develop a comprehensive inventory of the existing energy related research and assets within the State. Faculty leaders, mentors, and young faculty having energy related interests were identified and brought together to form interdisciplinary teams for the development of the research implementation proposal. A DOE/EPSCoR Advisory Board was formed to provide input from energy experts. A review of the existing strengths, such as amount of funding, number of graduate students supervised, number of refereed publications, number of postdoctoral personnel, and the nature and impact of the research on the State of South Carolina allowed for the identification of target areas for research development. These areas included groundwater modeling and environmental restoration. Workshops, seminars, and informal meetings were held in connection with the planning grant. These activities allowed for the establishment of linkages with several DOE laboratories and the development of research cluster proposals which were included in the South Carolina DOE/EPSCoR Research Implementation Proposal submitted March 1, 1993. A summary of these activities is provided herein.

12314 (ETDE-IT–94-32) **ENEA's role in environmental protection.** ENEA, Rome (Italy). May 1992. 29p. Order Number DE94752591. Source: OSTI; NTIS (US Sales Only); INIS.

The 1990-1994 Five-Year Plan of ENEA (the Italian Agency for New Technology, Energy and the Environment) stipulates that the Agency must reconcile its objectives related to energy with those related to the environment by aiming at a more efficient and rational exploitation of energy sources. This necessity has been reiterated in Italian Law 282/91 which assigns ENEA the task of providing technical and scientific support to the Ministry of the Environment. The aims, work schedule and financing of this task have been laid down in an environmental protection program whose main goals include: the protection and use rationalization of water supplies; the development of waste processing and disposal systems which incorporate energy and materials recovery systems; and the setting up of environmental monitoring networks. Within the framework of these activities, this paper reports on the management and organization aspects of five integrated projects which involve research efforts on: the reduction of the environmental impact of industrial activities; the characterization, status and dynamics of the environment; the interrelationships between environmental quality and the health of human populations; the effects of agricultural-industrial activities on global climate; the effects of human activities on the environmental quality of the Mediterranean Sea.

12315 (IAEA-TECDOC–727) **Manual for the classification and prioritization of risks due to major accidents in process and related industries: Inter-Agency programme on the assessment and management of health and environmental risks from energy and other complex industrial systems.** International Atomic Energy Agency, Vienna (Austria); United Nations Environmental Programme; United Nations Industrial Development Organization, Vienna (Austria); World Health Organization, Geneva (Switzerland). Dec 1993. 60p. Order Number DE94616012. Source: OSTI; NTIS (US Sales Only); INIS.

This document presents, in fact, a third generation or ranking methods. The first generation, an inventory procedure, was developed by D. van den Brand for the province of South Holland and is only available in Dutch. The second generation was developed by TNO Environmental and Energy Research, Netherlands, on request and was mainly based on the ideas of D. van den Brand, representative of the governmental body in the Netherlands. This second generation guideline has been translated into several languages and is called The Guide to Hazardous Industrial Activities. The present document is the third generation; although using much of the same technical data, it has its own purpose and various important additions as well as a so-called step by step approach not used in earlier work. 10 figs, 20 tabs.

12316 (LA-SUB–93-296) **Evaluation of OPEN PLAN software: Final report.** Los Alamos National Lab., NM (United States); Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 5 Mar 1991. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008097. Source: OSTI; NTIS; GPO Dep.

In fulfilling the objectives of the contract to evaluate the suitability of the OPEN PLAN software system to process existing Environmental Restoration (ER) data, Jacobs Engineering Group (JEG) divided the effort into seven discrete tasks. Overall results of the tasks performed demonstrated that OPEN PLAN could be used in conjunction with the currently used TIMELINE to provide resource leveling and meet all reporting requirements. The OPEN PLAN report generator could automatically produce reports which were equivalent to existing ER cost reports being produced manually or by spreadsheet. User documentation was provided and on-site

training was performed. The result of the cost and schedule tracking support was the creation of new spreadsheet based reports using TIMELINE and LOTUS 1-2-3. Some additional modifications may need to be made to incorporate installation specific needs as well as any changes in reporting requirements.

12317 (NEI-FI–218) **Environmental Agreements with Foreign States.** Ministry of the Environment, Helsinki (Finland). 1992. 20p. (In Finnish). Order Number DE94721990. Source: OSTI; NTIS.

International environmental law has developed rapidly during the last decades. To this date some 160 multilateral agreements belonging to the field of the environment have been adopted worldwide. Of these, over a hundred have been negotiated during the last twenty years. The 1972 United Nations Conference on the Human Environment marked a turning point in the development of international environmental law. For the first time, global environmental problems were brought onto the international arena. The present list provides an overview of those multilateral Nordic and bilateral environmental agreements to which Finland is a party. The list contains 170 agreements and protocols and their amendments. The list is based on the United Nations Environment Programme's (UNEP) register of international treaties and agreements in the field of the environment. In addition to 'traditional' environmental agreements, new areas have been included, such as agreements concerning the working environment and disarmament. Accordingly, the list contains agreements that do not specifically fall within the field of competence of the Ministry of the Environment. The titles of the agreements are given in Finnish. Swedish and English. In addition, the list contains the date and place of adoption as well as the date of entry into force in Finland. The agreements are in achronological order, according to the date of adoption. The full official texts in Finnish and English are published in 'Suomen saeaedoeskokoelman sopimussarja'. The Swedish version is published in 'Finlands foerfattningssamlings foerdragsserie'. The list will be regularly updated by the Ministry of the Environment.

12318 (OY/PSTL-RR–109) **Valuing environmental benefits using the contingent valuation method.** Maentymaa, E. Oulu Univ. (Finland). Research Inst. of Northern Finland. 1993. 140p. (In Finnish). Order Number DE94722020. Source: OSTI; NTIS.

The aim of this research is to determine the monetary value of the environment of the lake Oulujaervi, using the contingent valuation or CV method. The target is to assess the applicability of the method in Finland and the reliability of the results. The households of the Oulujaervi would be willing to pay on average some hundred FIM/a for the quality of the water. In the demand functions of water quality, the income level and the age of the respondents appears to be the most reliable regressors of the high marginal willingness to pay. The results of the research can be utilized in assessing the total profitability of large projects related to water systems. Despite the problems of the CV method, the results can be regarded reliable if information of the population's degree of willingness to pay is sufficient for decision making.

12319 (OY/TTO-DP–4) **Carbon dioxide abatement as a differential game.** Tahvonen, O. Oulu Univ. (Finland). 1993. 31p. Order Number DE94722023. Source: OSTI; NTIS; INIS.

The report combines predictions on greenhouse warming, CO_2 abatement costs and adaptation costs in a differential game framework. The specified model makes it possible to solve the payoffs of the subgame perfect solution of a two state variable nonautonomous problem with N unequal countries. Abatement cost parameters are calibrated with a global energy sector model and climate parameters are based on empirical time series. Simulation suggests that the backstop technology assumption in the abatement cost model may imply drastic cuts in optimal emission levels. Compared to the Nash noncooperative equilibrium a pareto optimal agreement is found to be beneficial for developing countries but more costly for the industrial world. Given the present damage estimates, the losses due to an emission stabilizing agreement may be 400 times higher than maximum potential gains from cooperation.

2904 Energy Resources

Refer also to citation(s) 12785

2905 Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 11754, 11910, 11944, 12284, 12292, 12313, 12332, 12414, 12417, 12487, 12996

12320 (HW–59717) **Hanford Laboratories Operation monthly activities report, March 1959.** General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 15 Apr 1959. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94006310. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report summarizes the work performed at Hanford Laboratories during March 1959. Specifically, this Monthly Activities Report describes the following: Reactor and Fuels Research and Development Operation; Physics and Instrument Research and Development Operation; Chemical Research and Development Operation; Biology Operation; Operations Research and Synthesis Operation; Programming; Radiation Protection Operation; Laboratory Auxiliaries Operation; Employee Relations Operation; Financial Operation; and the Invention Report. A general summary of the activities performed at Hanford Laboratories and a listing of staff and force report and personnel status changes are included.

12321 (INIS-mf–14176) **German Delphi report on the development of science and technology.** Fraunhofer-Institut fuer Systemtechnik und Innovationsforschung (ISI), Karlsruhe (Germany); Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Aug 1993. 684p. (In German). Order Number DE94747576. Source: OSTI; NTIS (US Sales Only); INIS.

Adopting the Japanese strategy and approach, the German Delphi study has come out with a detailed analysis of 16 important subject fields of science and technology (as, e.g., energy, ecology, astronautics, environmental engineering, nuclear physics, elementary particle physics) and has taken this database reflecting the expert knowledge in Germany as a source for adventuring in a consensusoriented forecast of future development trends. The study was intended to offer a platform for debate about the results and data published, and to forster the dialogue between science, industry and politics and to thus initiate a process eventually ending in the definition of goals and concepts reconciling the sometimes diverging interests of the various fields of science or technology. (HP)

12322 (KFK–5226) **Problems of method of technology assessment: A methodological analysis.** Zimmermann, V. Kernforschungszentrum Karlsruhe GmbH (Germany). Abt. fuer Angewandte Systemanalyse. Mar 1993. 102p. (In German). Order Number DE94747336. Source: OSTI; NTIS (US Sales Only); INIS.

The study undertakes to analyse the theoretical and methodological structure of Technology Assessment (TA). It is based on a survey of TA studies which provided an important condition for theoreticall sound statements on methodological aspects of TA. It was established that the main basic theoretical problems of TA are in the field of dealing with complexity. This is also apparent in the constitution of problems, the most elementary and central approach of TA. Scientifically founded constitution of problems and the corresponding construction of models call for interdisciplinary scientific work. Interdisciplinarity in the TA research process is achieved at the level of virtual networks, these networks being composed of individuals suited to teamwork. The emerging network structures have an objective-organizational and an ideational basis. The objective-organizational basis is mainly the result of team composition and the external affiliations of the team members. The ideational basis of the virtual network is represented by the team members' mode of thinking, which is individually located at a multidisciplinary level. The theoretical 'skeleton' of the TA knowledge system, which is represented by process knowledge based linkage structures, can be generated and also processed in connection with the knowledge on types of problems, areas of analysis and procedures to deal with complexity. Within this process, disciplinary

knowledge is a necessary but not a sufficient condition. Metatheoretical and metadisciplinary knowledge and the correspondingly processes complexity of models are the basis for the necessary methodological awareness, that allows TA to become designable as a research procedure. (orig./HP)

12323 (SAND–93-2004C) **Dual-benefit technologies at Sandia National Laboratories.** Schaefer, D.W. Sandia National Labs., Albuquerque, NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9309335–1: Pulp and paper mill of the future conference, Orono, ME (United States), 8-10 Sep 1993). Order Number DE94006352. Source: OSTI; NTIS; GPO Dep.

What does the pulp and paper industry have in common with the desert southwest and nuclear weapons? As a representative of one of the Nations three nuclear weapons design laboratories (Los Alamos National Laboratory, Livermore National Laboratory and Sandia National Laboratories), my goal is to identify "dual-benefit" technologies where codevelopment will both strengthen the nation's competitive position and enhance national security. In development of this presentation, I found more common elements than I could possibly survey in this brief period.

12324 (SAND–94-0196C) **The National Center for Advanced Information Components Manufacturing: Program update.** Jorgensen, J. (Sandia National Labs., Albuquerque, NM (United States)); McBurnett, S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940247–2: IS&T/Society of Photo-optical Instrumentation Engineers (SPIE) meeting on electronic imaging science and technology, San Jose, CA (United States), 6-10 Feb 1994). Order Number DE94006364. Source: OSTI; NTIS; GPO Dep.

The National Center for Advanced Information Components Manufacturing (NCAICM) Projects focus on manufacturing processes, materials, user facilities, standard tools, and equipment for large area emissive flat panel displays and microelectronics. Two types of projects are funded: (1) precompetitive projects done at the Center, and (2) joint industry/national laboratory projects, which may carry intellectual property rights, where the work will be done at the appropriate industry or laboratory site. A summary of the NCAICM Projects will be presented.

2906 Nuclear Energy

Refer also to citation(s) 11720, 11766, 11852, 12300

12325 (IAEA-SM–332, pp. 32-33) **Communicating about advanced nuclear energy plants.** Bisconti, A.S. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Conclusions on social research regarding communications about advanced design nuclear power plants in the USA are reviewed.

12326 (IAEA-SM–332, pp. 34-35) **Factors affecting the acceptance of nuclear energy.** Scheuch, E.K. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Factors affecting the acceptance of nuclear energy and activities directed to help populations of different countries to better understand issues connected with its use are described.

12327 (LA-SUB–94-25) **N-STAR/IMAGE Project: Final report.** Driver, R.K. (Science Applications International Corp., Englewood, CO (United States). Foreign Systems Research Center). Los Alamos National Lab., NM (United States); Science Applications International Corp., Englewood, CO (United States). Foreign Systems Research Center. 30 Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005662. Source: OSTI; NTIS; GPO Dep.

This is the final report on the N°IMAGE project. It contains a brief abstract of the project background, objectives, efforts taken to achieve the objectives, and publications provided. The Soviet Union has devolved into various autonomous republics, each having individual nationalistic agendas, yet retaining many of the indigenous capabilities and facilities that were present prior to the dissolution of the USSR. Military forces, especially nuclear, still exist in spite of the changes in the overarching control hierarchy. The Commonwealth of Independent States [CIS] has been created, ostensibly maintaining control over the strategic forces of the now-defunct Soviet Union. These changes have created an identifiable need to understand the old forces in a new context. It is important to understand the political, social, and economic structures that bear on the new environment. Information on the individual republics and former Soviet Union is coming in at a staggering rate; it must be assimilated and analyzed while being careful not to lose those existing data points and analysis of Soviet information that are still relevant. The objective of the proposed FSRC work was to provide user-friendly, automated analytical tools to assist the analyst in assessing various aspects of Russia and CIS Nuclear Weapons. For each, the data package includes an extensive, free-form, interactive database system (N-STAR), a hierarchical structure of questions which lead an analyst through the essential elements of the related decisionmaking process (IMAGE), and an instruction manual explaining the use of the systems and their interrelationships. Relevant data su porting the analysis will be available in a standard format on the same system, facilitating data fusion and assessment. These analyst tools are in the form of Macintosh-compatible software systems (N-STAR and IMAGE) along with supporting documentation.

12328 (SAND–91-8010/3) **The history of NATO TNF policy: The role of studies, analysis and exercises conference proceedings: Volume 3: Papers by Gen. Robert C. Richardson III (Ret.).** Rinne, R.L. (ed.). Sandia National Labs., Livermore, CA (United States). Feb 1994. 220p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94007465. Source: OSTI; NTIS; GPO Dep.

This conference was organized to study and analyze the role of simulation, analysis, modeling, and exercises in the history of NATO policy. The premise was not that the results of past studies will apply to future policy, but rather that understanding what influenced the decision process-and how-would be of value. The structure of the conference was built around discussion panels. The panels were augmented by a series of papers and presentations focusing on particular TNF events, issues, studies, or exercises. The conference proceedings consist of three volumes. Volume 1 contains the conference introduction, agenda, biographical sketches of principal participants, and analytical summary of the presentations and discussion panels. Volume 2 contains a short introduction and the papers and presentations from the conference. This volume contains selected papers by Brig. Gen. Robert C. Richardson III (Ret.).

2910 Conservation

Refer also to citation(s) 12314, 12397, 12403, 12445

12329 (PNL–8965) **Supply curve impacts of Quick Start projects in Phase 1 of the Resource Supply Expansion Program.** Wright, G.A.; Warwick, W.M.; Durfee, D.L. Pacific Northwest Lab., Richland, WA (United States). Dec 1993. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94004751. Source: OSTI; NTIS; GPO Dep.

The Pacific Northwest Laboratory (PNL) prepared this report under contract to the Bonneville Power Administration (Bonneville), as part of the Resource Supply Expansion Project (RSEP). RSEP is a regional program instituted by Bonneville to expand conservation and renewable generation options available to resource planners and utilities. Resource alternatives are increased by RSEP through demonstration projects designed in a collaborative process that targets specific barriers to resource development including institutional, market, and reliability barriers. RSEP was launched with several projects that were designed and implemented quickly in 1992 to lay a foundation for future collaboration. The purpose of this report is to introduce the goal and structure of RSEP and to describe the so-called "Quick Start" RSEP projects in Phase One of RSEP. This description includes a preliminary estimate of the energy savings and/or other expected impacts of RSEP projects funded in FY 1992 and 1993. Similar estimates are also included for Bonneville projects to confirm wind and geothermal generation potential. Bonneville's Geothermal Confirmation Agenda preceded implementation of RSEP, although it has a similar objective and collaborative approach.

2920 Supply, Demand, and Forecasting

Refer also to citation(s) 11562, 12338, 14241, 14242

12330 (DOE/DP–0124T) **Emergency and backup power supplies at Department of Energy facilities: Augmented Evaluation Team – Final report.** USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Safety Diagnostic Div. Nov 1993. 143p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007246. Source: OSTI; NTIS; GPO Dep.

This report documents the results of the Defense Programs (DP) Augmented Evaluation Team (AET) review of emergency and backup power supplies (i.e., generator, uninterruptible power supply, and battery systems) at DP facilities. The review was conducted in response to concerns expressed by former Secretary of Energy James D. Watkins over the number of incidents where backup power sources failed to provide electrical power during tests or actual demands. The AET conducted a series of on-site reviews for the purpose of understanding the design, operation, maintenance, and safety significance of emergency and backup power (E&BP) supplies. The AET found that the quality of programs related to maintenance of backup power systems varies greatly among the sites visited, and often among facilities at the same site. No major safety issues were identified. However, there are areas where the AET believes the reliability of emergency and backup power systems can and should be improved. Recommendations for improving the performance of E&BP systems are provided in this report. The report also discusses progress made by Management and Operating (M&O) contractors to improve the reliability of backup sources used in safety significant applications. One area that requires further attention is the analysis and understanding of the safety implications of backup power equipment. This understanding is needed for proper graded-approach implementation of Department of Energy (DOE) Orders, and to help ensure that equipment important to the safety of DOE workers, the public, and the environment is identified, classified, recognized, and treated as such by designers, users, and maintainers. Another area considered important for improving E&BP system performance is the assignment of overall ownership responsibility and authority for ensuring that E&BP equipment performs adequately and that reliability and availability are maintained at acceptable levels.

12331 (LBL–34555) **The theory and practice of decoupling.** Eto, J.; Stoft, S.; Belden, T. Lawrence Berkeley Lab., CA (United States). Jan 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007498. Source: OSTI; NTIS; GPO Dep.

Decoupling revenues from sales is an important regulatory option under consideration by regulators seeking to transform utilities from sellers of a least-cost energy commodity to providers of least-cost energy services. This report examines decoupling from three perspectives. First, the authors consider threshold issues for decoupling, including characterization of the ratemaking practices addressed by decoupling which make incremental sales profitable to utilities, the role of rate case frequency in limiting the consequences of this incentive, and finally the existence of other incentives to sell electricity, which are not addressed by decoupling. Second, they examine the operation and performance of decoupling, including the mechanics of decoupling as a between-rate-case modification to the traditional ratemaking process, the ability of revenue-per-customer decoupling versus traditional ratemaking to recover nonfuel costs accurately, and a comparison of the profit implications of various decoupling approaches. Third, they review the rate impacts of decoupling for California's electric utilities, which have had the longest experience with decoupling.

2930 Policy, Legislation, and Regulation

Refer also to citation(s) 11577, 11678, 12346

12332 (DOE/S–0107) **Making contracting work better and cost less: Report of the Contract Reform Team.** USDOE, Washington, DC (United States). Feb 1994. 163p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007234. Source: OSTI; NTIS; GPO Dep.

In June 1993, Secretary of Energy Hazel O'Leary formed a Contract Reform Team, chaired by Deputy Secretary Bill White, to evaluate the contracting practices of the Department of Energy and to formulate specific proposals for improving those practices. This report summarizes the results of the work of the Contract Reform Team. It recommends actions for implementation that will significantly improve the Department's contracting practices and will enable the Department to help create a government that – in the words of Vice President Gore – "works better and costs less." These actions and the deadlines for their implementation are listed. Among other things, they recommend replacing the Department's standard Management and Operating Contract with a new Performance-Based Management Contract and strengthening the Department's systems for selecting and managing contractors.

12333 (LA-UR–93-2793) **The role of the risk communicator in the permitting process.** Durbin, M.E.; Wahl, L.E. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940534–1: 41. annual conference of the Society for Technical Communication, Minneapolis, MN (United States), May 1994). Order Number DE93018287. Source: OSTI; NTIS; GPO Dep.

Under various federal regulations, waste treatment facilities, waste disposal sites, incinerators, and similar facilities require permits for operation. Such permits are supported by detailed studies that demonstrate the need for the facility, the appropriateness of the site, the environmental impact of the project, the safety of the technology used, and the agency's ability to operate it safely. The National Environmental Policy Act (NEPA) requires public participation, including public meetings, hearings, or other forms of participation, in all permitting processes to ensure "complete assessment and full disclosure of the environmental consequences" of proposed actions under the act. Other regulations (notably the Emergency Response and Community Right to Know Act, Title III of the Superfund Amendments and Reauthorization Act [SARA]) are broad risk communication statutes that ensure that the information is available through statutes, public hearings, and the media. Regulations such as these should ensure adequate public participation. The people should be able to voice concerns and work out compromises at public meetings. In theory, the agency should be able to satisfy its responsibilities to the public simply by filing the

permit application, preparing the supporting documentation, and participating in public hearings. Theory, however, is not borne out by practical experience. Active opposition by the public to projects that meet all permitting regulations has defeated dozens of incinerator, power plant, and landfill projects in the past decade.

12334 (NEI-FI–214, pp. 9-69) **The Finnish energy strategy.** Hannus, S. (Ministry of Trade and Industry, Helsinki (Finland). Energy Department). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The author reviews in his presentation the Finnish energy policy and the role of it as a tool for directioning and control of energy production and consumption. He also discusses energy economy on firm basis, as well as the targets of the Finnish energy economy, and the available tools of energy policy, including research and experimentation, financial support, taxation of the energy, norms and other administrative measures, information delivery, counselling and training, and international cooperation. He also reviews the possibilities to improve the energy efficiency in order to reduce energy consumption, and the means for promoting production and utilization of bioenergy, and the possibilities to secure the Finnish energy supply under different circumstances.

12335 (NEI-FI–214, pp. 85-96) **New bioenergy programme in Finland.** Perttala, T.L. (Ministry of Trade and Industry, Helsinki (Finland). Energy Department). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The leading objectives for the Finnish energy policy have long been to ensure the energy supply and the diversity of energy sources. In the national energy strategy, a greater emphasis has been focused on measures leading to sustainable development, like environmental protection, energy concervation and renewable energy sources. Finland is today one of the leading users of bioenergy in the world. About 18 % of the primary energy consumption is based on biomass sources. The total consumption of indigenous fuels is 5.4 million toe/a. Bioenergy is produced mainly as heat or in the form of combined heat and power generation by conventional boiler technology. At present, increasing interest is focused on the utilization of wood as an energy source. The Finnish wood reserves place no limitations even on considerable increase of the energy usage of wood. The most optimistic calculations estimate that at least 20 % of the primary energy consumption of the first decades of the 21st century will be covered by bioenergy. The Finnish Ministry of Trade and Industry has started the preparation of new energy research programmes. Specific programmes will be devoted to bioenergy and the energy impacts in the transportation sector. The research programmes will be carried through during 1993-1998. The Bioenergy research programme consists of four sectors: The production and supply of biomass, with applications for the small- scale utilization; research on peat production, with applications for the small-scale utilization; industrial utilization of biomass, and utilization of waste in bioenergy production and as biogas.

12336 (ORNL/M–1572) **Environmental Guidance Program Reference Book: Comprehensive Environmentally Response, Compensation, and Liability Act.** Oak Ridge National Lab., TN (United States). [1991]. 635p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94002589. Source: OSTI; NTIS; GPO Dep.

This Reference Book contains a current copy of the Comprehensive Environmental Response Compensation, and Liability Act and those regulations that implement the statute and appear to be most relevant to Department of Energy (DOE) activities. The document is provided to DOE and contractor staff for informational purposes only and should not be interpreted as legal guidance. Updates that include important new requirements will be provided periodically. Questions concerning this Reference Book may be directed to Mark Petts, EH-231 (FTS 896-2609 or Commercial 202/586-2609).

2940 Fossil Fuels

Refer also to citation(s) 11562, 11565, 11577, 11584, 11596, 12314, 12344, 14241, 14242

12337 (INIS-mf–13749, pp. 94) **Remote laser monitoring of atmospheric pollution in Baku city.** Melikov, S.H. (Azerbaijan National Aerospace Agency, Baku (Azerbaijan)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AIR POLLUTION MONITORS/lasers; LASERS; REMOTE SENSING

12338 (LBL–34144) **Primer on gas integrated resource planning.** Goldman, C. (Lawrence Berkeley Lab., CA (United States)); Comnes, G.A.; Busch, J.; Wiel, S. Lawrence Berkeley Lab., CA (United States); Oak Ridge National Lab., TN (United States). Dec 1993. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098 ; AC05-84OR21400. Order Number DE94007500. Source: OSTI; NTIS; GPO Dep.

This report discusses the following topics: gas resource planning: need for IRP; gas integrated resource planning: methods and models; supply and capacity planning for gas utilities; methods for estimating gas avoided costs; economic analysis of gas utility DSM programs: benefit-cost tests; gas DSM technologies and programs; end-use fuel substitution; and financial aspects of gas demand-side management programs.

2950 Hydrogen and Synthetic Fuels

Refer also to citation(s) 12347

2960 Electric Power

Refer also to citation(s) 12289, 12301

12339 (DOE/BP–2318) **Bonneville Power Administration final draft Strategic Marketing Plan, February 1994.** USDOE Bonneville Power Administration, Portland, OR (United States). Feb 1994. 133p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007592. Source: OSTI; NTIS; GPO Dep.

The Bonneville Power Administration (BPA) has developed a marketing plan to define how BPA can be viable and competitive in the future, a result important to BPA's customers and constituents. The Marketing Plan represents the preferred customer outcomes, marketplace achievements, and competitive advantage required to accomplish the Vision and the Strategic Business Objectives of the agency. The Marketing Plan contributes to successful implementation of BPA's Strategic Business Objectives (SBOs) by providing common guidance to organizations and activities throughout the agency responsible for (1) planning, constructing, operating, and maintaining the Federal Columbia River Power System; (2) conducting business with BPA's customers; and (3) providing required internal support services.

12340 (DOE/BP–2325) **1993 Pacific Northwest Loads and Resources Study, Pacific Northwest economic and electricity use forecast: Technical appendix: Volume 1.** USDOE Bonneville Power Administration, Portland, OR (United States). Feb 1994. 98p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008563. Source: OSTI; NTIS; GPO Dep.

This publication documents the load forecast scenarios and assumptions used to prepare BPA's Whitebook. It is divided into: intoduction, summary of 1993 Whitebook electricity demand forecast, conservation in the load forecast, projection of medium case electricity sales and underlying drivers, residential sector forecast, commercial sector forecast, industrial sector forecast, non-DSI industrial forecast, direct service industry forecast, and irrigation forecast. Four appendices are included: long-term forecasts,

LTOUT forecast, rates and fuel price forecasts, and forecast ranges-calculations.

12341 (DOE/EIA–0226(94/02)) **Electric power monthly, February 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. 16 Feb 1994. 192p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007235. Source: OSTI; NTIS; GPO; GPO Dep.

The Electric Power Monthly (EMP) presents monthly electricity statistics. The purpose of this publication is to provide energy decisionmakers with accurate and timely information that may be used in forming various perspectives on electric issues that lie ahead. Data in this report are presented for a wide audience including Congress, Federal and State agencies, the electric utility industry, and the general public. The EIA collected the information in this report to fulfill its data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (Public Law 93-275) as amended. This publication provides monthly statistics at the US, Census division, and State levels for net generation, fossil fuel consumption and stocks, quantity and quality of fossil fuels, cost of electricity sales, revenue, and average revenue per kilowatthour of electricity sold. Data on net generation, fuel consumption, fuel stocks, quantity and cost of fossil fuels are also displayed for the North American Electric Reliability Council (NERC) regions. Statistics by company and plant are published in the EPM on the capability of new generating units, net generation, fuel consumption, fuel stocks, quantity and quality of fuel, and cost of fossil fuels.

12342 (DOE/EIA–0437(92)/2) **Financial statistics of major US publicly owned electric utilities 1992.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels. Jan 1994. 536p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007105. Source: OSTI; NTIS; GPO; GPO Dep.

The 1992 edition of the Financial Statistics of Major US Publicly Owned Electric Utilities publication presents 4 years (1989 through 1992) of summary financial data and current year detailed financial data on the major publicly owned electric utilities. The objective of the publication is to provide Federal and State governments, industry, and the general public with current and historical data that can be used for policymaking and decisionmaking purposes related to publicly owned electric utility issues. Generator and nongenerator summaries are presented in this publication. Four years of summary financial data are provided. Summaries of generators for fiscal years ending June 30 and December 31, nongenerators for fiscal years ending June 30 and December 31, and summaries of all respondents are provided. The composite tables present aggregates of income statement and balance sheet data, as well as financial indicators. Composite tables also display electric operation and maintenance expenses, electric utility plant, number of consumers, sales of electricity, and operating revenue, and electric energy account data. The primary source of publicly owned financial data is the Form EIA-412, "Annual Report of Public Electric Utilities." Public electric utilities file this survey on a fiscal year, rather than a calendar year basis, in conformance with their recordkeeping practices. In previous editions of this publication, data were aggregated by the two most commonly reported fiscal years, June 30 and December 31. This omitted approximately 20 percent of the respondents who operate on fiscal years ending in other months. Accordingly, the EIA undertook a review of the Form EIA-412 submissions to determine if alternative classifications of publicly owned electric utilities would permit the inclusion of all respondents.

12343 (DOE/SWPA–9401) **Southwestern Power Administration 1993 annual report.** USDOE Southwestern Power Administration, Tulsa, OK (United States). [1993]. 44p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007581. Source: OSTI; NTIS; GPO Dep.

This booklet is divided into an overview (mission statement, map, performance, etc.), the year in review, financial and statistical report, financial and statistical report, financial and statistical data, and SPA organization.

12344 (EGG-RAAM–10980) **A systems model and potential leverage points for base load electric generating options.** Brownson, D.A.; Hanson, D.J.; Price, L.G.; Sebo, D.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008525. Source: OSTI; NTIS; GPO Dep.

The mission and structure of electric utilities may change significantly to meet the challenges on the next several decades. In addition, providing electrical energy in an environmentally responsible manner will continue to be a major challenge. The methods of supplying electrical power may change dramatically in the future as utilities search for ways to improve the availability and reliability of electrical power systems. The role of large, base load generating capacity to supply the bulk of a utility's electrical power is evolving, but it will continue to be important for many years to come. The objective of this study is to examine the systems structure of five base load capacity options available to a utility and identify areas where technological improvements could produce significant changes in their systems. These improvements would enhance the likelihood that these options would be selected for providing future electrical capacity. Technology improvements are identified and discussed, but it was beyond the scope of this work to develop strategies for specific Idaho National Engineering Laboratory involvement.

12345 (ORNL/TM–12321) **Factors affecting expanded electricity trade in North America.** Hill, L.J. Oak Ridge National Lab., TN (United States). Jan 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007054. Source: OSTI; NTIS; GPO Dep.

The authors explore factors that affect electricity trade between enterprises in the US and Canada and the US and Mexico. They look to those underlying policy and institutional factors that affect the relative costs of producing electricity in the three countries. In particular, they consider six factors that appear to have a significant impact on electricity trade in North America: differences in the types of economic regulation of power leading to differences in cost recovery for wholesale and retail power and wheeling charges; changing regulatory attitudes, placing more emphasis on demand-side management and environmental concerns; differences in energy and economic policies; differences in national and subnational environmental policies; changing organization of electric power industries which may foster uncertainty, change historical relationships, and provide other potentially important sources of power for distribution utilities; and differences in the ability of enterprises to gain access to electric power markets because of restrictions placed on transmission access. In Section 2, the authors discuss the regulation of electricity trade in North America and provide an overview of the recent trading experience for electricity between Canada and the US and between Mexico and the US, including the volume of that trade over the past decade and existing transmission capacity between regions of the three countries. In Section 3, they look at the benefits that accrue to trading counties and what those benefits are likely to be for the three countries. The discussion in Section 4 centers on the relevant provisions of the Canada Free Trade Agreement and the proposed North American Free Trade Agreement. In Section 5, they set the stage for the discussion of policy and institutional differences presented in Section 6 by outlining differences in the organization of the electric power sectors of Canada, the US, and Mexico. The study is synthesized in Section 7.

2980 Consumption and Utilization

Refer also to citation(s) 12378, 12401

2990 Unconventional Sources and Power Generation

Refer also to citation(s) 11910, 12344

12346 (DOE/FTR–94003547) **Travel to Africa to gather information on the prospects of a Renewable Energy of African Development Program (REFAD): Foreign trip report, August**

21, 1993–September 10, 1993. Thompson, G. National Renewable Energy Lab., Golden, CO (United States). 13 Oct 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94003547. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The US Export Council for Renewable Energy (US/ECRE), the Department of Energy (DOE), the US Agency for International Development (AID), Sandia National Laboratories and the National Renewable Energy Laboratory, (NREL) have come together in a new program to support economic and social development in Africa. The Renewable Energy for African Development (REFAD) Program is a collaborative effort between the US private and public sectors for the purpose of fostering sustainable development through the marketing and appropriate use of renewable energy technologies in Southern Africa. The REFAD team spoke with the host country government officials; US Embassy/AID officials; non-governmental representatives; and private sector industry members to get a broad perspective of the barriers & potential of increased use of RETs in the region.

12347 (KTM/E-B–150) **NEMO - Advanced energy systems and technologies: Final report on the energy research programme 1988-1992.** Lund, P. (Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Technical Physics). Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. 1993. 144p. (In Finnish). Project KTM-128/881/87. Order Number DE94721996. Source: OSTI; NTIS.

NEMO Research Programme.

In this report, the contents and major results of the national research program- me on advanced energy system and technologies (NEMO) are presented. The NEMO-programme was one of the energy research programmes of the Ministry of Trade and Industry during 1988- 1992. Helsinki University of Technology had the responsibility of the overall coordination of the program- me. NEMO has been the largest resource allocation into advanced energy systems in Finland so far. The total budget was 70 million FIM. The focus of the programme has been in solar energy, wind power, and energy storage. Hydrogen and fuel cells have been included in smaller amount. On all major fields of the NEMO-programme, useful and high quality results have been obtained. Results of international significance include among others arctic wind energy, new approaches for the energy storage problem in solar energy applications, and the development of a completely new storage battery. International collaboration has been given high priority. The NEMO-programme has also been active in informing the industries of the various business and utilization possibilities that advanced energy technologies offer. For example, major demonstration plants of each technology group have been realized. It is recommended that the further R and D should be still more focused on commercial applications. Through research efforts at universities, a good technology base should be maintained, whereas the industries should take a stronger position in commercializing new technology. Parallel to technology R and D, more public resources should be allocated for market introduction.

12348 (NEI-FI–214, pp. 71-84) **Development and using clean domestic fuels - a slide presentation.** Gross, T.J. (U.S. Department of Energy, Washington D.C. (United States)). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The primary energy flows in USA, the U.S. energy sources by sector, and the CO_2 emission of the electric power generating technologies in USA are discussed. The directioning of the fuel consumption by the U.S. government and the energy authorities and the funding for the replacement of fossil fuels in energy production are also reviewed. A short overview of biomass electric power capacity by feedstock in USA, and the potential for biomass in electric power generation is given. The utilization of biomass based fuels as automotive and engine fuels and the emissions caused by the utilization of them are finally reviewed.

12349 (NEI-FI–214, pp. 97-116) **U.S. biofuels program - slide presentation.** Costello, R. (U.S. Department of Energy, Washington D.C. (United States). Technology Division). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

the U.S. biofuels research program and the role of it as a part of the U.S. national energy strategy are discussed. The existing urban air pollution in USA, the 1990 Clean Air Act Amendments (CAAA) and the attributes of alcohol and ethers to implement the CAAA, as well as the problems in the transportation sector to fulfil the requirements are reviewed. The possibilities and potential of biofuels production and utilization, the conversion technologies for biomass into fuels, and the utilization and emissions of biomass derived ethanol as automotive fuel are presented.

12350 (SAND–94-0552C) **Solar activities at Sandia National Laboratories.** Klimas, P.C.; Hasti, D.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940443–1: Globalcon: congress and exhibition for energy and environmental technologies, Anaheim, CA (United States), 6-7 Apr 1994). Order Number DE94007737. Source: OSTI; NTIS; GPO Dep.

The use of renewable energy technologies is typically thought of as an integral part of creating and sustaining an environment that maximizes the overall quality of life of the Earth's present inhabitants and does not leave an undue burden on future generations. Sandia National Laboratories has been a leader in developing and deploying many of these technologies over the last two decades. A common but special aspect of all of these activities is that they are all conducted in cooperation with various types of partners. Some of these partners have an interest in seeing these systems grow in the marketplace, while others are primarily concerned with economic benefits that can come from immediate use of these renewable energy systems. This paper describes solar thermal and photovoltaic technology activities at Sandia that are intended to accelerate the commercialization of these solar systems.

30 DIRECT ENERGY CONVERSION

3001 MHD Generators

Refer also to citation(s) 12030

12351 (DOE/ID/12735–T29) **Projects at the Component Development and Integration Facility: Quarterly technical progress report, July 1–September 30, 1993.** MSE, Inc., Butte, MT (United States). [1993]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE94008176. Source: OSTI; NTIS; GPO Dep.

This quarterly technical progress report presents progress on the projects at the Component Development and Integration Facility (CDIF) during the first quarter of FY94. The CDIF is a major US Department of Energy test facility in Butte, Montana, operated by MSE, Inc. Projects in progress include: MHD Proof-of-Concept project; mine waste technology pilot program; plasma projects; resource recovery project; sodium sulfide/ferrous sulfate project; soil washing project; and spray casting project.

12352 Method of and system for producing electrical power. Carabetta, R.A.; Staats, G.E.; Cutting, J.C. To Dept. of Energy. 1992. Filed date 28 Jan 1992. U.S. patent application 7-826,697. 19p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007355. Source: OSTI; NTIS; GPO Dep.

A method and system for converting the chemical energy of methane to electrical energy. Methane is thermally decomposed to hydrogen and carbon in a decomposing unit at a temperature not less than about 1200°K and at a pressure at least slightly above atmospheric pressure. Carbon and substantially pure oxygen and a cesium or potassium seed material is transmitted to a combustor

which is maintained at a pressure of at least about 50 atmospheres to combust the carbon and oxygen and provide an ionized plasma having a temperature not less than about 2900°K. The ionized plasma is accelerated to a velocity not less than about 1000 m/sec and transported through an MHD generator having a magnetic field in the range of from about 4 to about 6 Tesla to generate dc power. The ionized plasma is deaccelerated and passed from the MHD generator in heat exchange relationship with the methane to heat same for decomposition, and thereafter any cesium or potassium seed material is recovered and transported to the combustor, and the dc power from the MHD generator is converted to ac power.

3003 Thermoelectric Generators

12353 (LA-SUB–93-259) **Silicon-germanium/gallium phosphide material in high power density thermoelectric modules: Final report, February 1980–September 1981.** Los Alamos National Lab., NM (United States); Syncal Corp., Sunnyvale, CA (United States). [1981]. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005657. Source: OSTI; NTIS; GPO Dep.

This is the final report of work on the characterization of an improved Si-Ge alloy and the fabrication of thermoelectric devices. The improved Si-Ge alloy uses a small addition of GaP in n- and p- type 80 at.% Si-20 at.% Ge; this addition reduces the thermal conductivity, thereby increasing its figure of merit and conversion efficiency. The thermoelectric devices fabricated include multicouples intended for use in Radioisotope Thermoelectric Generators (RTGs) and ring-type modules intended for use with nuclear reactor heat sources. This report summarizes the effort in the material as well as the device areas and discusses individual phases of each area. Results should form basis for further effort.

12354 **Superconducting thermoelectric generator.** Metzger, J.D.; El-Genk, M. To Dept. of Energy. 1992. U.S. patent application 7-841,169. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007341. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus and method for producing electricity from heat. The present invention is a thermoelectric generator that uses materials with substantially no electrical resistance, often called superconductors, to efficiently convert heat into electrical energy without resistive losses. Preferably, an array of superconducting elements is encased within a second material with a higher thermal conductivity than that of the superconducting material. The second material is preferably a semiconductor. Alternatively, the superconducting material can be doped on a base semiconducting material, or the superconducting material and the semiconducting material can exist as alternating, interleaved layers of waferlike materials. A temperature gradient imposed across the boundary of the two materials, establishes an electrical potential related to the magnitude of the temperature gradient. The superconducting material carries the resulting electrical current at zero resistivity, thereby eliminating resistive losses. The elimination of resistive losses significantly increases the conversion efficiency of the thermoelectric device.

3004 Thermionic Converters

Refer also to citation(s) 12489

3005 Fuel Cells

Refer also to citation(s) 12082, 12454, 12581

12355 (DOE/MC/29237–3512) **Detailed design of the 2MW Demonstration Plant: Topical report, Task 2.** Fuel Cell Engineering Corp., Danbury, CT (United States). 16 Sep 1993. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29237. Order Number DE94000042. Source: OSTI; NTIS; GPO Dep.

This document provides a summary of the design of the 2MW carbonate fuel cell power plant which will be built and tested under DOE cooperative agreement DE-FC2I-92MC29237. The report is divided into sections which describe the process and stack module design, and Appendices which provide additional design detail. Section 2.0 provides an overview of the program, including the project objectives, site location, and schedule. A description of the overall process is presented in Section 3.0. The design of the fuel cell stack Modules is described in Section 5.0, which discusses the design of the fuel cell stacks, multi-stack enclosures, and Stack Modules. Additional detail is provided in a report Appendix, the Final Design Criteria Summary. This is an abstract of the design criteria used in the design of the Submodules and Modules.

12356 (DOE/METC–93/6132, pp. 239-249) **Overview of ERC's carbonate fuel cell development program.** Baker, B.S. (Energy Research Corp., Danbury, CT (United States)); Bentley, C.R.; Glenn, D.R. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The near-term elements of ERC's Direct Carbonate Fuel Cell commercialization program are described. These elements are: product development, manufacturing, demonstration power plants, early production units, customer relations, market analysis, and organization.

12357 (DOE/METC–93/6132, pp. 250-254) **Overview of M-C power's MCFC Power Generating System.** Woods, R.R. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective to the IMHEX Commercialization Program is to develop market-responsive molten carbonate fuel cell products. The program has four integrated elements: Technology Development, Field Verification, Manufacturing Technologies, and Market Development. The program goal is to achieve initial market entry by the late 1990s. Ongoing product definition activities are focusing on a nominal 1 MW power plant which achieves an electric generation efficiency of 50% HHV. The marketing and commercialization program is discussed.

12358 (DOE/METC–93/6132, pp. 255-262) **MCFC product development test.** Kush, A.K.; Leo, A.J.; O'Shea, T.P. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective of the 2MW Santa Clara Demonstration Project is the demonstration of the direct carbonate fuel cell technology at full scale. Specific objectives of the project include the demonstration of advantages of the carbonate fuel cell power plant, such as high efficiency, low emissions, reactive power capability, and high reliability and availability. The project will also provide a design base for pre-commercial power plants.

12359 (DOE/METC–93/6132, pp. 263-279) **Molten carbonate fuel cell product development test.** Camara, E.H.; Scroppo, J.A.; Figueroa, R.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

M-C Power Corp. will design, fabricate, install, test, and evaluate a 250 kW Proof-of-Concept MCFC Power Plant. The plant, to be located at Kaiser Permanente's San Diego Medical Center in San Diego, California will be designed and built by Bechtel Corp., which is responsible for the design, detailed engineering, construction

management, and start-up of the proposed system. The PDT design objectives will include improved performance at reduced cost compared with the Unocal POC. Other design objectives that will distinguish this demonstration from the Unocal demonstration will be more compact packaging, longer unattended operation, and increased reliability. Additionally, the experience gained during the design and construction of the Unocal power plant will be incorporated. Control system automation will be increased to include start-up. This power plant is being designed for compatibility with the SDG&E electrical distribution grid.

12360 (DOE/METC–93/6132, pp. 280-287) **MCFC Power Plant System verification.** Bernard, R.; Doyon, J.; Paetsch, L.; Patel, P.; Skok, A.; Yuh, C. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The carbonate fuel cell promises highly efficient, cost-effective, environmentally superior power generators for pipeline natural gas as well as coal-gas fuels. ERC has been engaged in the development of this unique technology from the very early years, primarily focusing on the development of the direct fuel cell (DFC) technology. ERC's carbonate fuel cell goals are commercialization of MW-Class natural gas units in the near-term and 100 MW-Class coal gas/natural gas dual-fuel units later. ERC is ready to demonstrate a 2MW natural gas power plant at the City of Santa Clara, CA in the 1994-1996 time frame, as a major milestone towards achieving this objective. The on-going program effort aggressively prepared this efficient energy conversion technology for the demonstration phase.

12361 (DOE/METC–93/6132, pp. 288-289) **Simulated coal gas MCFC power plant system verification.** Benjamin, T.G.; Camara, E.H.; Marianowski, L.G.; Petraglia, V.J.; Laurens, R.M. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The overall program objective is the demonstration of a full-scale, full-height IMHEX® molten carbonate fuel cell stack in a 250-kW power plant test. Issues impending development of manufacturing and testing facilities will be addressed in support of MCFC stack research and power plant development. Issues will be identified and resolved in engineering, manufacturing, assembling, cost, performance, and endurance of the stack repeat and non-repeat components. The tasks of the program are: (1) Commercialization (2) Power Plant Development (3) Manufacturing Facilities Development (4) Testing Facility Development (5) Stack Research (6) Advanced Research & Technology Development.

12362 (DOE/METC–93/6132, pp. 293-298) **High temperature solid oxide fuel cell development activities.** USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

An overview of the Westinghouse Solid Oxide Fuel Cell (SOFC) development activities and current program status is presented. The goal is to develop a cell that can operate for 50,000 to 100,000 hours. Progress toward this goal is discussed and test results presented for multiple single cell tests which have now successfully exceeded 40,000 hours of continuous power operation at temperature. Curves are presented which demonstrate the improved cell performance and life obtained to date.

12363 (DOE/METC–93/6132, pp. 299-303) **MSOFC development status.** Minh, N.Q. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The Monolithic solid oxide fuel cell (MSOFC) is an all-ceramic structure in which cell components are configured in a compact, corrugated array. The MSOFC produces a direct current by electrochemically combining fuel and oxidant across the zirconia solid electrolyte at an operating temperature of about 1000°C. The overall objective of this program is to advance materials and fabrication methodologies to develop a MSOFC system capable of meeting performance, life and cost goals for coal-derived fuel applications. The technical effort of this program is aimed at creating a technology base that will be used to extend MSOFC development from proof of concept toward practical application. The program culminates in fabrication and testing of a 100-w stack.

12364 (DOE/METC–93/6132, pp. 304-312) **High temperature solid oxide fuel cell-customer test units.** Veyo, S.E. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The deployment of customer test units began with the 400 W Westinghouse SOFC system tested by the Tennessee Valley Authority (TVA) in 1986. Subsequently, in 1987 to 1988, two 3 kW Westinghouse SOFC systems were tested in Japan. In 1992, testing of two 25 kW Westinghouse SOFC systems was initiated in Japan. The results of the 25 kW program are the principle focus of this report. Now under development for field deployment is a 100 kW SOFC system. The evolution of cell and stack design used in the customer test units is shown. The cell has evolved from a thick wall porous support tube design nominally 16 mm in outside diameter and of 300 mm active length to a cell without the porous support tube and of 1000 mm active length. The maximum power output per unit of cell length has increased from about 0.7 W/cm. to approximately 1.3 W/cm. Cell design and manufacturing processes have been developed using funds provided by DOE and its predecessor agencies and by Westinghouse. Results of these processes are presented.

12365 (DOE/METC–93/6132, pp. 313-322) **Contaminant effects in solid oxide fuel cells.** Maskalick, N.J. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

One objective of this study is to identify the long-term tolerance of solid oxide fuel cells (SOFC) to coal-derived fuel gas containing a mixture of three impurities: Hydrogen sulfide (H_2S), hydrogen chloride (HCl) and ammonia (NH_3), with the SOFC operating at 350 mA/cm^2. Another objective is to learn whether the performance at 1000°C of the SOFC at 350 mA/cm^2 would be affected by contact with silica (SiO_2), carried over as a hydrate. A third objective is to evaluate the effect on SOFC performance of zinc (Zn) impurity in coal-derived fuel gas, with and without HCl a a companion impurity. Post-test analyses are carried out to describe any interaction with the SOFC in terms of structural or chemical changes. These tests, which provide a basis for estimating the effects of operating the SOFC in the presence of specific amounts of the coal gas impurities NH_3, HCl, H_2S, SiO_2, and Zn are described.

12366 (DOE/METC–93/6132, pp. 323-324) **Commercialization of fuel cells in the 21st century.** Figueroa, R.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug

1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Fuel cell suppliers face economic and technical challenges in a competitive power generation market. It is likely that a subsidy (in the form of tax deductions, government assisted programs to buy down the cost of materials, etc.) will be needed to ensure economic competitiveness in the 2000 timeframe. Technology transfer from aerospace program may hold the key to breaking through some technical roadblocks in fuel cell technology. Therefore, DOE and DOD efforts in this area should be pursued.

12367 (DOE/METC–93/6132, pp. 386-392) **Research and development of alternative components at Argonne National Laboratory for molten carbonate fuel cells.** Krumpelt, M.; Kucera, G.H. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Many of the technical problems associated with the lifetime of molten carbonate fuel cells are materials related. The objective of this project is to address the technical problems that limit the lifetime of the molten carbonate fuel cell (MCFC). The overall effort is focused on assessing electronically conductive ceramic oxides as electrode materials and determining the effectiveness of alternative electrolyte formulations at reducing nickel oxide solubility, minimizing differential electrolyte migration, and reducing component corrosion.

12368 (DOE/METC–93/6132, pp. 393-397) **Sealant research for solid oxide fuel cells.** Bloom, I.; Krumpelt, M. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective of this work is to develop sealing materials for solid oxide fuel cells (SOFCs). A suitable sealant must form strong, dense bonds with SOFC components, be chemically and mechanically compatible with the components, be stable at 1000°C in the operating environment of the SOFC (H_2 and H_2O on the anode side, O_2 on the cathode side), and be electronically insulating. Advanced flat-plate and monolithic SOFC designs offer high electrochemical performance because of their short current paths. In these designs, gas-tight seals must be formed at the edges of the cells and between the stack and fuel and air manifolds. In general, the sealant must be compatible with the cell components and the cell environment. Further, the bonding material can be exposed to both oxidizing and reducing conditions simultaneously at high temperature. Reactions between the sealant and cell gases are clearly undesirable; the reactions can lead to cell failure. This program seeks to develop materials that are chemically stable toward the cell gases and that from adherent bonds to cell components.

12369 (DOE/METC–93/6132, pp. 398-408) **Alternative materials for solid oxide fuel cells: Processing and interactions of materials.** Chick, L.A.; Armstrong, T.R.; Bates, J.L. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Solid oxide fuel cells (SOFCs) continue to develop as promising, clean, and efficient technology for the direct conversion of hydrogen and fossil fuels to electrical energy. The purpose of this research is to develop alternative materials for SOFC interconnections and electrodes with improved electrical, thermal, and electrochemical properties. Another objective is to develop synthesis and fabrication methods for these materials whereby they can be processed in air into SOFCs. The approach is to (1) develop modifications of the current, state-of-the-art materials used in SOFCs, (2) minimize the number of cations used in the SOFC materials to reduce potential deleterious interactions, (3) improve thermal, electrical, and electrochemical properties, (4) develop methods to synthesize both state-of-the-art and alternative materials for the simultaneous fabrication and consolidation in air of the interconnections and electrodes with the solid electrolyte, and (5) understand electrochemical reactions at materials interfaces and the effects of component composition and processing on those reactions.

12370 (DOE/METC–93/6132, pp. 409-414) **Low cost, radial flow, solid oxide fuel cell.** Petrik, M.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Current development of solid oxide fuel cell (SOFC) technologies suffer from problems associated with high operating temperatures and harsh operating environments. The need to match coefficients of thermal expansion constrains materials choices and can requires high cost fabrication techniques. The Interscience Radial Flow (IRF) SOFC technology was designed specifically to minimize problems associated with high temperature operation and for manufacture by available and low cost fabrication techniques. The three key physical characteristics of the IRF design are its planar, non-sintered construction, the use of particulate materials to form porous electrodes, and the internal radial flow. The objective in this phase of the research was to demonstrate the feasibility of multicell stack operation. The performance milestone was 15% DC HHV efficiency with hydrogen at power densities greater than 50 mW/cm^2 in runs longer than 100 hours.

12371 (DOE/METC–93/6132, pp. 415-424) **Processing of $LaCrO_3$ for solid oxide fuel cell applications.** Huebner, W.; Nasrallah, M.M.; Anderson, H.U. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The Univ. of Missouri-Rolla has recently embarked on a 5 year research program dedicated towards the development of $LaCrO_3$-based interconnect powders which density when in contact with anode and cathode materials for solid oxide fuel cells (SOFC). During a previous DOE-METC program (DE-FG21-89MC26015) the authors developed and characterized potential cathode and interconnect materials. During the course of this program compositions within the pseudo-ternary $LaCrO_3$-$LaMnO_3$-$LaCoO_3$ systems were studied. Results indicated that some of the compositions in this system exhibited the requisite electrical conductivity and stability towards reduction, and could be sintered in air at temperatures less than 1450°C. In this research program, studies will be conducted on the processing and sintering of $LaCrO_3$ to make dense interconnects using $LaCrO_3$-based oxides at temperatures less that 1500°C in an air atmosphere and in contact with both anode and cathode oxides.

12372 (DOE/METC–93/6132, pp. 425-431) **Advanced research and technology development of MCFCs.** Remick, R.J.; Donado, R.A. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The molten carbonate fuel cells (MCFCS) currently under development use either 310S or 316L stainless steel for the bipolar separator plate and the cathode current collector. Although both of these materials exhibit resistance to corrosion by the alkali carbonate, significant chemical processing of the exposed surface of the metal takes place during the first 1000 hours of operation. The objective of this work is to evaluate methods for forming protective oxide layers of lithium ferrite ex-situ on the cathode-side stainless steel hardware of a molten carbonate fuel cell prior to cell/stack assembly. It is expected that once this ex-situ process is identified, it also will be possible to dope the protective oxide layer and achieve higher electrical conductivity and lower contact resistances than are experienced with the protective oxide layers that form in-situ when the cell/stack is first heated to operating temperature.

12373 (DOE/METC–93/6132, pp. 432-436) **Fuel cell handbook update.** Hirschenhofer, J.H.; Engleman, R.R. Jr.; Stauffer, D.B. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In 1980, the Institute of Gas Technology (IGT) published the "Handbook of Fuel Cell Performance" under a DOE contract. This document was later revised in 1988 under another DOE contract by Lawrence Berkeley Lab. to become "Fuel Cells, A Handbook." These previous publications serve as the basis for this latest version. The objective of this work was to update the 1988 version of DOE's Fuel Cell Handbook. Significant developments in the various fuel cell technologies required revisions to reflect state-of-the-art configurations and performance. The theoretical presentation was refined in order to make the handbook more useful to both the casual reader and fuel cell or systems analyst. In order to further emphasize the practical application of fuel cell technologies, the system integration information was expanded. In addition, practical elements, such as suggestions and guidelines to approximate fuel cell performance, were provided.

12374 (DOE/METC–93/6132, pp. 437-445) **Macrocrylic redox promoters for methanol oxidation.** Sarangapani, S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

Direct methanol fuel cell (DMFC) powered vehicles are foreseen as the choice of the future, because of its environmentally benign combustion products, potential for high efficiency and above all for its unlimited supply within US. The major obstacle in the development of methanol fuel cell is the methanol electrode, particularly, a catalyst for the oxidation of methanol. The overall goal of this program is to develop catalyst promoters that will result in longer and better performance of the presently used platinum catalysts for methanol oxidation. The specific technical objectives of this program are: (1) to synthesize several inorganic macrocyclic complexes that will act as promoters for methanol oxidation; (2) to improve the reactivity of the promoter core by (a) incorporating a mixture of promoters and (b) by covalent attachment of the promoters to the carbon substrate; (3) to conduct physical and electrochemical characterization of the complexes; (4) to conduct basic electrochemical studies of the role of promoters; (5) to conduct half-cell screening studies with the above complexes using liquid phase or gas phase methanol feed; and (6) to conduct direct methanol fuel cell experiments using polymer electrolyte membrane fuel cells.

12375 (DOE/METC–93/6132, pp. 446-455) **Optical sensor development for MCFCs: HCl detection through wavelength modulation diode laser absorption spectroscopy.** Funk, D.J.; Palmer, B.A.; Oldenborg, R.C. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

It is well established that there are many contaminants contained in coal gas that can harm MCFC fuel cells in both reversible and irreversible manners. These contaminants include but are not limited to, HCl, H_2S, H_2Se, AsH_3, NH_3, Zn, tar, and other trace metals. The Molten Carbonate Fuel Cell (MCFC) provides an attractive option for the extremely efficient conversion of coal-derived gas and/or natural gas to electricity. However, several technical issues need to be addressed before this option can be realized for use with coal-derived gas. In particular, contaminants found in coal gas can seriously degrade the performance of the cells through both reversible and irreversible processes. For example, side reactions with contaminants enhance the movement of the carbonate (electrolyte) and reduce the lifetime of the cell. There presently exist no in situ techniques for monitoring contaminants and/or for studying the underlying chemical kinetics and mechanisms behind fuel cell degradation. This program seeks to provide diagnostics for the understanding of the movement of the carbonate in the cell and the contamination processes that effect the operation of the fuel cell.

12376 (DOE/METC–93/6132, pp. 456-460) **Perovskite solid electrolytes for SOFC.** Sammells, A.F. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

We have synthesized a new series of brownmillerite solid electrolyte phases $BA_2GdIn_{1-x}GA_xO_5$ (x = 0,0.2,0.4) with the x = 0.2 phase exhibiting an unusually low E_a relative to both the observed ionic conductivity in this phase and to E_aS observed in similar compounds. We attribute measured ionic conductivity to a lack of available charge carriers in $Ba_2GdIn_{0.8}Ga_{0.2}O_5$. However, the low E_a supports the premist that brownmillerite solid electrolyte structures are suitable for supporting high ionic conductivity. Current work is focusing on enhancing the amount of charge carriers in these materials by systematically introducing disorder into the brownmillerite lattice.

12377 (Juel–2763) **Manufacturing processes and properties of components for the high temperature fuel cell.** Jansen, H. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Angewandte Werkstofforschung; Technische Hochschule Aachen (Germany). May 1993. 140p. (In German). Order Number DE94747634. Source: OSTI; NTIS (US Sales Only).

This work is concerned with various processes for the manufacture of 50 FC modules made of ceramic components and ceramic/metal compounds. First the possibiity of managing this task by plasma spraying was to be examined. Basic difficulties led to the fact that wet powder spraying (WPS) more and more displaced plasma spraying as the shaping process in the course of the work. Among the advantages of WPS to be mentioned are the small expense, the very good variability of thickness, microstructure and composition and the possibility of applying different layers in one operation. Apart from the parameters of the coating process (spraying distance, speed), the sintering process is of great importance. The coated foils must be covered during sintering. The pressure exerted determines the adhesion. The optimum sintering temperature for the cathode is 1200 C. The layers are then sintered to the foil substrate, without insulating external phases being formed. 1300 C is sufficient for good adhesion for the anode side, but external phases are not formed at high temperatures. The sintering time plays a lesser part for both electrodes. (orig./MM)

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

12378 (LBL–33819) **Energy use in Sweden: An international perspective.** Schipper, L. (Lawrence Berkeley Lab., CA (United States)); Johnson, F.; Howarth, R.; Price, L.; Andersson, B.; Andersson, B.G. Lawrence Berkeley Lab., CA (United States). Dec 1993. 147p. DOE Contract AC03-76SF00098. Order Number DE94007504. Source: OSTI; NTIS; GPO Dep.

This report analyzes the evolution of energy use in Sweden since the early 1970s. The purpose of the study, which is sponsored by NUTEK, Department of Energy Efficiency, the Swedish Agency for Technical and Industrial Development, is to shed light on the future path of energy use in Sweden by quantifying and understanding changes in past energy use. Energy efficiency has been identified by Swedish authorities in countless official studies as a key element in Sweden's efforts to restrain oil imports, reduce reliance on nuclear power, reduce environmental impacts of energy use, and reduce CO_2 emissions. To understand the role or performance of energy efficiency in the 1970s and 1980s in Sweden, and what this performance means about the future, the authors seek answers to three broad questions: (1) How has the structure and efficiency of energy use in Sweden evolved since the early 1970s, and where data permit, since even earlier? What caused these changes? (2) How does the structure of energy use in Sweden differ from that of other countries, and how has the evolution of energy use in Sweden differed from developments in other countries? (3) How much energy has Sweden saved, and why? Are these savings permanent? To what extent were they offset by changes in the structure of energy use? And to what extent is the magnitude of these savings dependent upon the way we measure energy use? The report reviews the long-term evolution of Swedish energy use, focusing on developments in five sectors of the economy: residential, service, industrial (manufacturing and "other industry" defined as mining, agriculture, forestry and fisheries, and construction), travel, and freight. The authors then examine Swedish energy use in a broader perspective, drawing detailed comparisons to other nations. Finally, they discuss a series of issues that hover over the future of energy demand in Sweden.

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Refer also to citation(s) 11953

12379 (BNL–52392, pp. 17-27) **Canadian R&D on oil-fired combustion systems.** Hayden, A.C.S. (CANMET, Ottawa, Ontario (Canada)); Entchev, E.; Lee, S.W. Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

This presentation will describe research and development presently being conducted on oil-fired space and water heating systems at the Combustion & Carbonization Research Laboratory (CCRL) in Ottawa, Canada. The presentation concentrates on activities at CCRL to develop suitable oil-fired integrated systems and control strategies to satisfy the low energy demands of new homes in Eastern Canada, a region which does not have alternative energy options, and so offers a promising growth market for oil. Other topics to be discussed include the potential for second generation retrofit of electrically heated homes and burner performance problems due to variations in fuel quality.

12380 (BNL–52392, pp. 29-36) **Residential cogeneration - the next step for the oil heat industry.** Sciacca, T. (Intelligen Energy Systems, Inc., Westford, MA (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

Residential energy usage falls into two general categories: Space and water heating, and electrical. Technology to reduce heating expenses is readily available, and heat conserving strategies can also improve occupant comfort levels. In contrast, products that reduce electrical usage usually do so only marginally and often with some lifestyle adjustment by the occupants. A new technology is available, however, that completely eliminates household electric bills and can, in fact, improve lifestyles by allowing electricity to be used more freely: Residential cogeneration. Cogeneration is the simultaneous production of heat and electricity. Electrical generation is inherently inefficient; on average only about one-third of the heat value of the fuel burned by a power plant is converted to electricity. Thomas Edison recognized the importance of making use of the waste heat by locating his first generators in large cities and using the leftover steam to heat nearby buildings. As economies of scale became more significant power plants grew larger and were increasingly sequestered away from urban areas and vented waste heat to the environment. After the oil shock of the seventies and the passage of the Public Utilities Regulatory Policies Act (PURPA) in 1978, however, cogeneration came back into favor for large industrial and commercial installations. More than half of all new generating capacity is now provided by industrial cogeneration. The feasibility of using cogeneration for supplying heat and electric power to homes is discussed.

12381 (BNL–52392, pp. 37-47) **Engineering evaluation of an oil-fired residential cogeneration system.** McDonald, R.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The definition of cogeneration, within the context of this paper, is the simultaneous production of electricity and heat energy from a single machine. This paper will present the results of an engineering analysis of the efficiency and energy-conservation potential associated with a unique residential oil-fired cogeneration system that provides both heat and electric power. The system operates whenever a thermostat signals a call for heat and electric power. The system is designed to burn No. 2 heating oil as a fuel, which is consumed in an 11-horsepower, two cylinder, 56.75-cubic-inch, 1850-RPM diesel engine. This unit is the only pre-production prototype residential oil-fired cogeneration system known to exist in the world. As such it is considered a landmark development in the field of oil-heat technology.

12382 (BNL–52392, pp. 49-62) **Applications of the flame quality indicator.** Butcher, T.A. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The Flame Quality Indicator (FQI) has been developed at Brookhaven National Lab. (BNL) as part of a program to study, generally, advanced control and sensor options for residential oil burners. During this study optical approaches were found to be very interesting and the FQI is a simple, first application of the results of that work. Details of the FQI concept and initial work with it have been discussed at earlier Oil Heat Conferences. Essentially, the FQI uses a standard cad cell sensor and circuit to convert flame brightness to a voltage signal. The circuit provides a red "service required" light when the brightness (voltage signal), in steady state, changes beyond a limit range. The burner must still be adjusted, initially, by a qualified serviceman; the FQI simply indicates when something has changed and the burner should be examined.

12383 (BNL–52392, pp. 63-73) **Integration of the energy kinetics system 2000 controller and the BNL Flame Quality Indicator.** Marran, J.D. (Energy Kinetics, Inc., Lebanon, NJ (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The concepts of a "Flame Quality Indicator" (FQI) for monitoring oil fired residential heating systems offers the oil industry an opportunity to further promote the advantages of its equipment and services to the consumer. It could put the oil industry in a position to offer the ultimate in a preventative maintenance program which features the principle advantages of oil heat over competing energy sources.

12384 (BNL–52392, pp. 75-84) **How to increase public/industry awareness of oil-heat energy conservation opportunities.** Irwin, A.A. (Nova Scotia Dept. of Natural Resources, Halifax, Nova Scotia (Canada)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The Nova Scotia Dept. of Natural Resources has developed a number of approaches to increase awareness on the part of the public industry groups of the opportunities for increased energy efficiency and conservation in housing. Several of these activities were directed specifically at the residential heating industry. The presentation will describe efforts to increase the use of efficiency test equipment. The effect of recent code developments pertaining to combustion efficiency testing and the revisions to the venting codes will be discussed. Recent issues in the industry with respect to the growing popularity of side wall venting, the provision of combustion air in today's tighter energy efficient homes and the retrofit of new high efficiency heating equipment into existing venting systems will be outlined.

12385 (BNL–52392, pp. 85-106) **Oil heat venting guidelines - vent materials and corrosion.** Krajewski, R.F. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

This paper presents a brief overview of work conducted in the application of metallic materials in oil-fired heating systems. The mechanism of sulfuric acid formation and the issue of surface corrosion of oil-fired heat exchangers are both discussed in terms of the implications of acid carried over into the vent system. The results of experiments studying vent wall temperature profiles are presented and discussed addressing the implications of water and acid dew point. A brief review of related research in metal corrosion rates in heat exchangers is presented and extended to the development of a proposed method of analyzing vent material loss through corrosion as a function of exposure time and temperature. The method is applied to actual laboratory time/temperature history test data for a vent system and the results are presented and discussed.

12386 (BNL–52392, pp. 107-120) **An overview of the BNL Oil Heat Vent Analysis Program (OHVAP).** Krajewski, R.F. (Brookhaven National Lab., Upton, NY (United States)); Strasser, J. Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

This paper provides an overview of the Oil Heat Vent Analysis Program (OHVAP). OHVAP is being developed in response to oil heat industry needs in vent system analysis and is designed for desk-top PC (DOS) computers. The rational for the development of a vent system analysis tool for the oil heat industry is discussed in terms of the need for properly sizing both chimney and advanced venting systems for mid- and high-efficiency oil-fired appliances. There are unique requirements for the venting of oil-fired appliances and the features that OHVAP will contain to meet these requirements are described. The Input Menu and Engineering program operation are described in some detail. The Input Menu is described in terms of the input sequence and flexibility of system representation for the analysis. The Engineering program description contains the basic theory behind the computational approach and a detailed step-by-step description of the program operation as it is carried out to obtain a solution. The current configuration of the OHVAP output is a data file format and a description of the data arrangement is presented. The program is being validated and the current status at this stage of development is discussed. As a result of the validation process some changes have already been implemented and some features remain under development. These are discussed along with future plans for OHVAP and it's application.

12387 (BNL–52392, pp. 121-130) **Fuel quality effects on home heating systems.** Litzke, W.L. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

Good fuel quality directly relates to better performance and more efficient operation of residential heating equipment. With current challenges that the oil heat industry has to face in the retail business, maintaining a competitive market requires quality and service for the homeowners. Brookhaven National Laboratory (BNL) has investigated the effects of fuel quality parameters on heating equipment and has developed countermeasures to ensure that quality is maintained. In order to disseminate this information and promote the concept of fuel quality on a practical level, a set of guidelines has also been developed specifically for service managers to use, either as reference material or training material for the service technicians. The highlights of the research work and the ideas developed in the set of guidelines will be presented in this paper.

12388 (BNL–52392, pp. 131-139) **Residential fuel quality study.** Santa, T.S. (Santa Fuel Inc., Bridgeport, CT (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

Measures to prevent fuel system failures are discussed. The purpose of the study was to determine the cause of fuel system failures and to develop a strategy to greatly reduce such failures. This strategy consisted of developing a method for identifying and quantifying fuel system failures and downloading statistics to a spreadsheet program and analyzing the results. The study involved fuel degradation, biological growth, and after mechanisms for bottom sediment formation. A guide for the storage of fuel oils was developed and the work that lies ahead is to apply the findings of this research to the particular conditions found in customers' fuel systems and identifying practical cost effective solutions.

12389 (BNL–52392, pp. 141-151) **Fouling of oil-fired boilers and furnaces.** Butcher, T.A. (Brookhaven National Lab., Upton, NY (United States)); Celebi, Y. Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

Fouling of the heat transfer surfaces of boilers and furnaces by "soot" leads to reduced efficiency and increased service requirements. The average level of annual efficiency reduction due to fouling is generally taken as 2% per year. Brookhaven National Laboratory (BNL) is currently studying causes of soot fouling for the purpose of identifying practical methods of minimizing these deposits. Studies of the fouling process in full sized boilers is difficult because of generally poor access to the heat transfer surfaces. Studies which include efficiency degradation as a measured parameter must be done over long time periods (months) to obtain efficiency changes large enough for measurable and repeatable results. Work at BNL has focused on the development of more rapid fouling tests which permit fouling deposits to be repeatably weighted and analyzed. Preliminary studies were done using water-cooled stainless steel fouling probes. This was followed by the development of a test which uses controlled temperature test sections where fouling deposits are formed on materials actually used in boilers and furnaces. This system, which has been used

for essentially all of the results included in this paper, was introduced during the 1991 Oil Heat Technology Conference. It is described as well in the next section.

12390 (BNL–52392, pp. 153-166) **An assessment of fuel oil heaters.** Litzke, W.L. (Brookhaven National Lab., Upton, NY (United States)); Butcher, T.A. Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The viscosity of No. 2 fuel oil affects heating equipment performance and varies as a function of fuel temperature. The nominal viscosity of No. 2 heating oil can range between 1.9 and 3.4 cSt (at 104 F) as specified by the ASTM. When fuel temperature decreases, such as during the winter season, the viscosity can increase substantially and poor atomization can occur. Methods to heat the fuel are sometimes used to maintain the viscosity to within the acceptable operating range. Nozzle line heaters are available commercially and can be used for preheating the fuel before it is atomized. These are designed as retrofit devices and, in some cases, as original equipment in a new burner. This paper describes work done at BNL to assess the benefits of such devices and other heating methods.

12391 (BNL–52392, pp. 167-175) **Advanced air-atomized burners.** Fisher, L.; Butcher, T.A. Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

Domestic oil burner designs in the USA have long been limited by the relatively low cost of oil so that the high initial cost of advanced technology to provide the efficiency gains was hard to justify. Another limitation has been caused by the lack of reliability of the conventional pressure-atomized nozzles used at rates below 0.60 gph oil input. Although the typical heating load of many homes today ranges from 0.25 to 0.60 gph, these homes are usually fired at inputs of 0.75 to 1.00 gph or higher.

12392 (BNL–52392, pp. 179-180) **New oil burner developments industry issues on the horizon.** Butcher, T.A. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The discussions were focused on problems with existing equipment and activities BNL might undertake to serve current and future needs of the industry. The major concern raised with current equipment was the service and reliability issues related to fuel quality. In considering advanced burners BNL should put an emphasis on ability to handle poor quality fuel without the need for excessive filtration. The Babbington burner which had been demonstrated at an earlier conference at BNL was discussed. Another area of concern raised was an apparent decline in the reliability of both ignition transformers and controls. Newer components are much less reliable than older designs. Considerable discussions about advanced control options were held. The BNL Flame Quality Indicator was seen as a very positive first step. In addition, however, the group would like to see sensors which will shut down the burner or provide a warning when a severe sooting situation has occurred. The FQI should call for service when a burner is starting to produce an excessive amount of soot but future controls should also look for a fouled heat exchanger problem. Sooting of homes is unacceptable and the industry must totally eliminate the possibility of this occurrence.

12393 (BNL–52392, pp. 181-183) **Guidelines for oil-appliance venting industry review and consensus actions.** Strasser, J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The workshop on oil appliance venting followed the list of suggested topics fairly well. Discussions centered around two overall topics: The forthcoming Venting Guidelines and the Oil Heat Vent Analysis Program. The first topic of discussion was the Venting Guidelines. The participants were brought up to date on the current status of the Guidelines. The talk then started going down the list of suggested questions from the Conference program. The question and answer session that followed included such questions as: Are vent/chimney inspections commonly performed during equipment service calls, what is the field experience regarding corrosion in the field, how well masonry chimneys performed for oil appliances, the fourth question regarding what materials should be used to insulate the vent connector never got addressed, and the last question about the Guidelines involved what additional avenues should be used to perform an adequate review.

12394 (BNL–52392, pp. 184-185) **Fuels, fuel quality, and storage industry perspective and actions.** Litzke, W.L. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The following topics were discussed at this workshop session: what actions are being taken by industry members to deal with fuel quality related problems; can a network or database system be established by industry members to refer to, for products evaluated out in the field and to share experiences and information; and BNL has put together a set of guidelines for maintaining fuel oil quality to be used as a reference and training material for servicemen and managers. How much interest is there to further develop, revise, and upgrade this booklet?

12395 (BNL–52392, pp. 186-187) **Oil-heat technology transfer industry role and future support.** Batey, J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). Sep 1993. (CONF-930385–: 1993 oil heat technology conference and workshop, Upton, NY (United States), 25-26 Mar 1993). In *Proceedings of the 1993 oil heat technology conference and workshop.* 195p. Order Number DE94001379. Source: OSTI; NTIS.

The following topics were discussed: The oil-heat industry has indicated that it is very interested in several new concepts (FQI, advanced oil-burner designs, etc.) currently being developed by BNL. How can the industry support, assist, and contribute to the commercialization of these ideas as finished products available on the market; how can the marketing industry help DOE in promoting the introduction of new high efficiency technologies currently under development; prior BNL/DOE/PMAA Oil-Heat Technology Conferences identified the need for an Oil-Heat Efficiency Training Manual for use by the industry in developing a firm understanding of the many options that exist to improve or upgrade the efficiency of oil-fired equipment or replace it with new modern high efficiency systems; how should the seminar's be organized and supported; how frequently should the information be reviewed and who should be responsible to update it; and will the manual need to be supported with other materials other than workbooks and slides.

12396 (DOE/BP–1913) **Lighting.** USDOE Bonneville Power Administration, Portland, OR (United States). Sep 1992. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC79-82BP31302. Order Number DE94007587. Source: OSTI; NTIS; GPO Dep.

Since lighting accounts for about one-third of the energy used in commercial buildings, there is opportunity to conserve. There are two ways to reduce lighting energy use: modify lighting systems so that they used less electricity and/or reduce the number of hours the lights are used. This booklet presents a number of ways to do both. Topics covered include: reassessing lighting levels, reducing lighting levels, increasing bulb & fixture efficiency, using controls to regulate lighting, and taking advantage of daylight.

12397 (ETDE-IT–94-38) **IAE energy conservation program for schools.** Lazzerini, R. No corporate text available. 1992. 15p. (In Italian). (CONF-9205399–2: International meeting on ventilation and air quality in school buildings, Rome (Italy), 28 May 1992). Order Number DE94752621. Source: OSTI; NTIS (US Sales Only).

Based on energy efficiency data available in 1974, OECD (Organization for Economic Co-operation and Development) studies predicted that, through the implementation of effective energy conservation programs, industrialized countries could reduce per capita energy consumption by as much as 50% in the long term. In response to this challenge, the International Energy Agency (IEA) was founded with the aim of promoting co-ordinated international energy conservation and renewable energy source research and development programs. This paper reports on the progress made in one such program called 'Energy Efficiency in Schools'. This program, combining the efforts of Italy and Great Britain, focussed on the development and use of computer programs and innovative monitoring techniques to determine the energy efficiency of school building architectural systems, thermal insulation and heating equipment. This paper briefly comments on the efficacy of the activities carried out under that program and outlines plans for a proposed extended program.

12398 (ETDE-IT–94-39) **Fresh air recharge normatives for Italian schools: Energy efficient ventilation equipment performance and costs.** Michelini, M. (ENEA, Casaccia (Italy). Area Energetica); Porfiri, M.T. No corporate text available. 1992. 10p. (In Italian). (CONF-9205399–3: International meeting on ventilation and air quality in school buildings, Rome (Italy), 28 May 1992). Order Number DE94752622. Source: OSTI; NTIS (US Sales Only).

In a survey of the present national status of Italian elementary and high schools with regard to air quality and type of installed heating and ventilation equipment, it was found that most school buildings are using conventional hot water radiator - fuel oil or gas fired boiler heating systems, while ventilation and air conditioning systems are virtually non- existent. Air recharge is accomplished by simply opening the windows whenever the internal room air becomes too stuffy. With the aim of assessing energy and equipment costs of a nation-wide effort to conform to international standards on building air quality and thermal comfort, this paper first reviews and compares current and proposed USA, European and Italian normatives. The paper then estimates the implications, in terms of overall costs, energy consumption and energy savings, of the installation of highly efficient ventilation systems equipped with suitable heat recovery equipment to meet future up-dated Italian standards regarding energy conservation, as well as, building air quality.

12399 (EUR–13541, pp. 177-187) **Replacement of R12 in refrigeration systems.** McMullan, J.T.; Murphy, N.E. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0055-C (EDB). (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries*. 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

This project will investigate possible routes for the replacement of refrigerant R12 in commercial and industrial refrigeration systems. The problems associated with R134a will be examined, and a search will be made for suitable binary mixtures. Attention will be paid to thermodynamics properties, lubrication problems, and the search for suitable lubricants (which still remain a significant problem area). Theoretical analysis will be carried out and backed up by experimental measurements.

12400 (KTM/E-B–142) **RAKET - Energy use in buildings: Master plan for an energy technology research programme 1993-1998.** Kohonen, R. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Heating and Ventilation). Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. 1993. 40p. Order Number DE94721995. Source: OSTI; NTIS.

RAKET Research Programme. The master plan is also published in Finnish as report no B:141.

The overall goal of the research programme is to develop and introduce energy conservation on solutions based on new construction, equipment and control technologies and to make the use of energy in buildings more efficient. To reach this goal, the RAKET programme: Develops generic energy conservation technology, equipment and structural concepts, and, combining these two, building-specific solutions that meet the requirements of good indoor air and are economically competitive. Promotes the application of energy conservation technology in practice by setting up consortia of companies and by organizing competitions for the development of new products, by gathering information on the applications of today's best technology and by developing design tools. Illustrates energy-efficient building technology and energy policy on the use of energy in buildings to consumers and decision-makers by organizing pilot building and demonstrations, at the same time creating sustainable demand for energy-efficient and environmentally sound building technology. Provides the decision-makers with information for the preparation and introduction of energy policy measures. The technological development goals of the RAKET programme include: 1. Economically competitive model solutions for buildings that consume only 1/4 of the present consumption of purchased energy. 2. Structural parts based on new glazing and insulation technology. 3. Energy-efficient construction and equipment solutions for renovation. 4. Product model based design methods and tools for energy and environmental conscious construction. 5. Real-time diagnostics and control methods for their equipment systems, and support systems for the operation.

12401 (LBL–32183) **An assessment of future energy use and carbon emissions from US residences.** Koomey, J.G.; Johnson, F.X.; McMahon, J.E.; Orland, M.C.; Levine, M.D.; Chan, P.; Krause, F. Lawrence Berkeley Lab., CA (United States). Dec 1993. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007501. Source: OSTI; NTIS; GPO Dep.

This paper explores residential energy futures and their associated carbon emissions using an engineering-economic end-use model. The authors present detailed input assumptions and output results for twenty-four cases, each representing a different combination of electricity supply mix, demand-side policy case, and carbon tax. They describe current and projected future energy use by end-use and fuel, and assess which end-uses are growing most rapidly in importance over time.

12402 (LBL–33342) **Monitoring peak power and cooling energy savings of shade trees and white surfaces in the Sacramento Municipal Utility District (SMUD) service area: Project design and preliminary results.** Akbari, H. (Lawrence Berkeley Lab., CA (United States)); Bretz, S.; Hanford, J.; Rosenfeld, A.; Sailor, D.; Taha, H.; Bos, W. Lawrence Berkeley Lab., CA (United States). Dec 1992. 262p. Sponsored by California Inst. for Energy Efficiency, Berkeley, CA (United States);Sacramento Municipal Utility District, CA (United States). DOE Contract AC03-76SF00098. Order Number DE94007503. Source: OSTI; NTIS; GPO Dep.

Urban areas in warm climates create summer heat islands of daily average intensity of 3–5°C, adding to discomfort and increasing air-conditioning loads. Two important factors contributing to urban heat islands are reductions in albedo (lower overall city reflectance) and loss of vegetation (less evapotranspiration). Reducing summer heat islands by planting vegetation (shade trees) and increasing surface albedos, saves cooling energy, allows down-sizing of air conditioners, lowers air-conditioning peak demand, and reduces the emission of CO_2 and other pollutants from electric power plants. The focus of this multi-year project, jointly sponsored by SMUD and the California Institute for Energy Efficiency (CIEE), was to measure the direct cooling effects of trees and white surfaces (mainly roofs) in a few buildings in Sacramento. The first-year project was to design the experiment and obtain base case data. We also obtained limited post retrofit data for some sites. This report provides an overview of the project activities during the first year at six sites. The measurement period for some of the sites was limited to September and October, which are transitional cooling months in Sacramento and hence the interpretation of results only apply to this period. In one house, recoating the dark roof with a high-albedo coating rendered air conditioning unnecessary for the month of September (possible savings of up to 10 kWh per day and 2 kW of non-coincidental peak power). Savings of 50% relative to an identical base case bungalow were achieved when a school bungalow's roof and southeast wall were

coated with a high-albedo coating during the same period. Our measured data for the vegetation sites do not indicate conclusive results because shade trees were small and the cooling period was almost over. We need to collect more data over a longer cooling season in order to demonstrate savings conclusively.

12403 (LBL–33587) **Worldwide status of energy standards for buildings: Appendices.** Janda, K.B.; Busch, J.F. Lawrence Berkeley Lab., CA (United States). Feb 1993. 166p. Sponsored by USDOE, Washington, DC (United States);Agency for International Development, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007497. Source: OSTI; NTIS; GPO Dep.

This informal survey was designed to gain information about the worldwide status of energy efficiency standards for buildings, particularly non-residential buildings such as offices, schools, and hotels. The project has three goals: 1. To understand and learn from the experience of countries with existing building energy standards; 2. To locate areas where these lessons might be applied and energy standards might be effectively proposed and developed; and 3. To share the information gathered with all participating countries. These appendices include the survey cover letter, the survey, and the details of selected energy standards in 35 countries, thus providing supporting material for the authors' article of the same title.

12404 (LBL–33962) **Thermal performance of residential duct systems in basements.** Treidler, B.; Modera, M. Lawrence Berkeley Lab., CA (United States). Feb 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007492. Source: OSTI; NTIS; GPO Dep.

There are many unanswered questions about the typical effects of duct system operation on the infiltration rates and energy usage of single- family residences with HVAC systems in their basements. In this paper, results from preliminary field studies and computer simulations are used to examine the potential for improvements in efficiency of air distribution systems in such houses. The field studies comprise thermal and flow measurements on four houses in Maryland. The houses were found to have significant envelope leakage, duct leakage, and duct conduction losses. Simulations of a basement house, the characteristics of which were chosen from the measured houses, were performed to assess the energy savings potential for basement house. The simulations estimate that a nine percent reduction in space conditioning energy use is obtained by sealing eighty percent of the duct leaks and insulating ducts to an R-value of 0.88 $°C \cdot m^2/W$ ($5°F \cdot ft^2 \cdot h/BTU$) where they are exposed in the basement. To determine the maximum possible reduction m energy use, simulations were run with all ducts insulated to 17.6 $°C \cdot m^2/W$ (100 $°F \cdot ft^2 \cdot h/BTU$) and with no duct leakage. A reduction of energy use by 14% is obtained by using perfect ducts instead of nominal ducts.

12405 (LBL–35036) **Office lighting: A review of 80 years of standards and recommendations.** Osterhaus, W.K.E. Lawrence Berkeley Lab., CA (United States). May 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9310285–1: Institute of Electrical and Electronic Engineers-Industry Applications Society (IEEE-IAS) annual meeting, Ontario (Canada), 2-8 Oct 1993). Order Number DE94007044. Source: OSTI; NTIS; GPO Dep.

This paper traces the development of quantitative office lighting standards from its beginnings to the present. It discusses the sources of recommended lighting practice, the nature of the quantitative recommendations, and trends in recommended values on a comparative basis. A critical assessment of contemporary standards is provided within this historical context.

12406 (NYSERDA–94-2) **Uncertainty analysis of the Measured Performance Rating (MPR) method: Final report.** NAHB Research Foundation, Inc., Upper Marlboro, MD (United States). National Research Center. Nov 1993. 197p. Sponsored by New York State Energy Research and Development Authority, Albany, NY (United States). Source: OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223.

A report was commissioned by the New York State Energy Research and Development Authority and the Electric Power Research Institute to evaluate the uncertainties in the energy monitoring method known as measured performance rating (MPR). The work is intended to help further development of the MPR system by quantitatively analyzing the uncertainties in estimates of the heat loss coefficients and heating system efficiencies. The analysis indicates that the MPR should detect as little as a 7 percent change in the heat loss coefficients and heating system efficiencies. The analysis indicate that the MPR should be able to detect as little as a 7 percent change in the heat loss coefficient at 95 percent confidence level. MPR appears sufficiently robust for characterizing common weatherization treatments; e.g., increasing attic insulation from R-7 to R-19 in a typical single-story, 1,100 sq. ft. house resulting in a 19 percent reduction in heat loss coefficient. Furnace efficiency uncertainties ranged up to three times those of the heat loss coefficients. Measurement uncertainties (at the 95 percent confidence level) were estimated to be from 1 to 5 percent for heat loss coefficients and 1.5 percent for a typical furnace efficiency. The analysis also shows a limitation in applying MPR to houses with heating ducts in slabs on grade and to those with very large thermal mass. Most of the uncertainties encountered in the study were due more to the methods of estimating the "true" heat loss coefficients, furnace efficiency, and furnace fuel consumption (by collecting fuel bills and simulating two actual houses) than to the MPR approach. These uncertainties in the true parameter values become evidence for arguments in favor of the need of empirical measures of heat loss coefficient and furnace efficiency, like the MPR method, rather than arguments against.

12407 (ORNL/CON–318) **Evaluation of potential performance additives for the advanced lithium bromide chiller.** Reiner, R.H.; Del Cul, W.; Perez-Blanco, H.; Ally, M.R.; Zaltash, A. Oak Ridge National Lab., TN (United States). Apr 1991. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007916. Source: OSTI; NTIS; GPO Dep.

The effectiveness and stability of potential heat-and-mass transfer (performance) additives for an advanced lithium bromide (LiBr) chiller were evaluated in a series of experimental studies. These studies of additive effectiveness and stability were necessary because many currently used performance additives decompose at the high generator temperatures (220°C to 260°C) desired for this particular advanced LiBr chiller. For example, one common performance additive, 2-ethyl-l-hexanol (2EH), reacts with the corrosion inhibitor, lithium chromate (Li_2CrO_4), even at moderate generator temperatures ($\geq$180°C). These stability problems can be mitigated by using less reactive corrosion inhibitors such as lithium molybdate (Li_2MoO_4) and by using more stable performance additives such as 1-heptanol (HEP) or 1H,1H,7H-dodecafluoro-1-heptanol (DFH). There seems to be a trade-off between additive stability and effectiveness: the most effective performance additives are not the most stable additives. These studies indicate that HEP or DFH may be effective additives in the advanced LiBr chiller if Li_2MoO_4 is used as a corrosion inhibitor.

12408 (VTT-PUB–134) **Thermal coupling of leakage air and heat flows in buildings and in building components: Development and application of numerical methods.** Virtanen, M. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Heating and Ventilation). Technical Research Centre of Finland, Espoo (Finland). 1993. 178p. Order Number DE94722014. Source: OSTI; NTIS.

Numerical methods have been introduced for the thermal analysis of air leakages in building components and in buildings as a whole. The study focuses on crack and filtration flows. The numerical formulation of the model equations is based on the finite difference method and the reliability of the two-dimensional numerical methods developed at the structural level have been experimentally confirmed. For energy analyses of buildings, an application of the response factor method for leaky structures, is also introduced. A simulation procedure for the simultaneous solution of air flow and heat balances is elaborated. In this procedure the heat balance of a building is solved by means of the so-called convective heat balance model as well as the response factor method

developed. The air flow balance is solved in a quasi steady-state condition, using the MOVECOMP program as a basis. In the analyses at the structure level, the thermal interactions of structures and leakage air flows in some typical air leakage cases are examined. The dependence of heat transfer (the heat recovery effect) on the leakage air flow rate, the length and location of the leakage path, the dimensions and thermal property values of the structure and on the heat transfer coefficients of the surfaces are analysed numerically. A single family house with a mechanical exhaust ventilation system was chosen for the case studied. According to analyses, it is evident that both the omission of the heat recovery elect of infiltrating/exfiltrating air and using the constant exfiltrating airflow rate tend to overestimate the calculated heating load compared with the actual heating load. Finally, thermal analyses are carried out on a house with so-called dynamic walls.

3202 Transportation

Refer also to citation(s) 12453, 12749, 12780, 12985, 13031

12409 (ANL–93/39) **On the unsteady-motion theory of magnetic forces for maglev.** Chen, S.S.; Zhu, S.; Cai, Y. Argonne National Lab., IL (United States). Nov 1993. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007765. Source: OSTI; NTIS; GPO Dep.

Motion-dependent magnetic forces are the key elements in the study of magnetically levitated vehicle (maglev) system dynamics. In the past, most maglev-system designs were based on a quasisteady-motion theory of magnetic forces. This report presents an experimental and analytical study that will enhance our understanding of the role of unsteady-motion-dependent magnetic forces and demonstrate an experimental technique that can be used to measure those unsteady magnetic forces directly. The experimental technique provides a useful tool to measure motion-dependent magnetic forces for the prediction and control of maglev systems.

12410 (ANL/ES/CP–82064) **Review and status of maglev in the United States.** Coffey, H.T. Argonne National Lab., IL (United States). [1993]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931102–3: International conference on speed technology for railway and maglev vehicles, Yokohama (Japan), 22-25 Nov 1993). Order Number DE94006832. Source: OSTI; NTIS; GPO Dep.

This report contains a slide show on the status and future of Maglev type transportation systems in the United States.

3203 Industrial and Agricultural Processes

Refer also to citation(s) 11657, 11674, 11690, 11711, 11877, 11920, 11979, 12000, 12303, 12305, 12306, 12307, 12309, 12323, 12399, 12618, 12767, 12768, 12769, 12783, 12988, 13019, 13032, 13063, 13106, 14244

12411 (DOE/CE/40812–1) **High performance steam cogeneration (proof-of-concept phases): Phase 2, HRSG 500-hour test report: Final report.** Campbell, A.H. Solar Turbines, Inc., San Diego, CA (United States). Dec 1992. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-87CE40812. (SR–90-R-552731). Order Number DE94006747. Source: OSTI; NTIS; GPO Dep.

Recent advances in small once-through Alloy 800 steam generators, improved materials technology, and application of small industrial gas turbine technology to steam turbine cogeneration offers the potential to make a step increase in steam temperature from around 1000°F, where industry has been for almost fifty years, to 1500°F. In small cogeneration systems, it is economically practical to introduce new technology and make a step change in temperature where it may not be possible (given the regulatory environment and economic risk) for a major change in steam temperature to be introduced in the hundreds of megawatt size of an electric utility. Increasing the peak steam temperature in a steam turbine cycle allows more work to be extracted or electrical power to be generated from a given quantity of heat input. Figure 1 plots steam efficiency as a function of superheat steam temperature and pressure for a turbine-back pressure of 166 psia. This figure clearly shows that increasing the steam conditions from the typical current practice of 900°F and 900 psia to 1500°F and 1500 psia will increase the steam cycle efficiency by 53%. The combination of higher cycle efficiency with an advanced high efficiency steam turbine design provides a substantial increase in turbine output power for a given steam flowrate. The output of this advanced high temperature steam turbine is approximately twice that of a current industrial practive turbine for the same turbine flowrate as seen in Figure 2.

12412 (DOE/CE/40874–4) **Ferrous scrap preheating system: Phase 2, Final report.** Surface Combustion, Inc., Maumee, OH (United States). 23 Nov 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-89CE40874. Order Number DE94004170. Source: OSTI; NTIS; GPO Dep.

Utilization of electric arc steel making has allowed many smaller producers to compete with the large mills. An electric arc furnace (EAF) melts scrap metal to produce a variety of steel products. Using scrap as the metal source is less costly than refining from ores, but the metal is of a lower quality due to impurities in the scrap. Over the years, methods have been developed to improve EAF metal quality and reduce the cost of production. As a result, an increasing share of total steel production is shifting to EAFs. By recent estimates, EAF production is growing at a rate of about 10% per year, and currently accounts for nearly one half of all US steel production (US Department of Energy and Electric Power Research Institute Project 2787-2, 1987). The subject of this report is Scrap Preheating, a new method of preheating scrap metal before it is charged into an EAF. In scrap preheating, a portion of the energy is supplied in a separate vessel, causing the EAF to use less energy, which shortens the heating time. The general effect is that the arc furnace can produce more steel in a given time at a reduced cost per ton of molten metal.

12413 (DOE/CH/10093–199) **Industrial innovations for tomorrow: Advances in industrial energy-efficiency technologies: Installation of ultrafiltration/reverse osmosis system at automotive coatings plant minimizes hazardous waste.** National Renewable Energy Lab., Golden, CO (United States); Energetics, Inc., Columbia, MD (United States). Dec 1993. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93000064. Source: OSTI; NTIS; GPO Dep.

Short communication. HAZARDOUS MATERIALS/waste management; WASTE WATER/water treatment; FILTRATION; OSMOSIS; AUTOMOBILES; COATINGS

12414 (DOE/ID/12695–T1) **Scrap tire recycling: Promising high value applications: Final report.** Bauman, B.D.; Leskovyansky, P.J.; Drela, H. Air Products and Chemicals, Inc., Allentown, PA (United States). Nov 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-88ID12695. Order Number DE94008166. Source: OSTI; NTIS; GPO Dep.

Surface modification of scrap tire rubber (rubber particles treated with chlorine gas) show promise for ameliorating the scrap tire problem (the treated rubber can be used as a component in high-performance, expensive polymer systems). The process has been proven in Phase I. Phase II covers market/applications, process development (Forberg-design mixer reactor was chosen), plant design, capital cost estimate, economics environmental/safety/health, and energy impact. Almost of the small amount of chlorine is consumed. The capital costs for a rubber particle treatment facility are attractive, being at least two orders of magnitude less than that of facilities for making new polymer materials. Large volume markets using treated rubber are needed. The amount of scrap rubber available is small compared to the polymers available for replacement. 7 tabs, 16 figs.

12415 (DOE/MC/11076–3620) **The use of coal fly ash for soil stabilization.** Brown, T.H.; Brown, M.A.; Sorini, S.S.; Huntington, G. University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst. Dec 1991. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-86MC11076. Order Number DE94000089. Source: OSTI; NTIS; GPO Dep.

The objective of this work was to examine the potential use of Wyoming subbituminous coal fly ash materials for cementation of soil materials. Specimens made from Laramie River (LR) fly ash had higher unconfined compression strength and more brittleness than the Specimens made with Dave Johnston (DJ) fly ash. However, soil/DJ fly ash mixtures that were cured for 28 days had relatively good strengths without the brittleness that the LR specimens developed. These characteristics of the DJ fly ash may be important attributes for road stabilization applications. The detailed mineralogical evaluation provides some insight into which minerals may enhance development of strength in these materials. In general, selective dissolution of the soil/fly ash mixtures shows that many of the potentially toxic elements (e.g., B, Cr, Fe, Mn, Ni, Pb) are associated with the sulfide phase (HNO_3 extractable) and with the residual material. In this study, the dynamics of elemental release from the element pools did not result in toxic conditions. The formation of colloidal material capable of mobilizing potentially toxic elements was not found in the soil/fly ash mixtures. Apparently the high pH of the materials enhanced immobilization of the high molecular weight material.

12416 (DOE/MC/28060–94/C0276) **Truck ramp construction from clean coal technology waste products.** Wolfe, W.E. (Ohio State Univ., Columbus, OH (United States). Dept. of Civil Engineering); Beeghly, J.H. Dravo Lime Co., Pittsburgh, PA (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-91MC28060. (CONF-9310272–1: Symposium on recovery and effective reuse of discarded materials and by-products for construction of highway facilities, Denver, CO (United States), 19-22 Oct 1993). Order Number DE94006004. Source: OSTI; NTIS; GPO Dep.

The construction and performance of a truck ramp made from clean coal technology waste products are described. The specific waste product used in this project was generated at the power plant located on the campus of The Ohio State University in Columbus. The ramp is used by University vehicles depositing hard trash at a central disposal facility on the OSU campus. Laboratory tests which had been conducted on samples made from the power plant waste product clearly showed that, when the material is properly compacted, strengths could be obtained that were much higher than those of the natural soils the clean coal waste would replace. In addition, the permeability and swelling characteristics of the waste product should make it an attractive alternative to importing select borrow materials. Based on the results of the laboratory tests, a decision was made to use the power plant waste in the truck ramp rather than the soil that was called for in the original design. Prior to the start of construction, the area on which the ramp was to be located was covered with an impermeable geomembrane. Drain lines were installed on top of the geomembrane so that water that might leach through the ramp could be collected. The waste product from the power plant was placed on the geomembrane in 20 to 30 centimeter lifts by University maintenance personnel without special equipment. A drain line was installed across the toe of the ramp to intercept surface runoff, and a wearing surface of 7 to 15 centimeters of crushed limestone was placed over the compacted ash. The finished ramp structure recycled approximately 180 metric tons of the power plant byproduct. After over a year in service there is no indication of erosion or rutting in the ramp surface. Tests performed on the leachate and runoff water have shown the high pH characteristic of these materials, but concentrations of metals fall below the established limits.

12417 (ETDE-IT–94-37) **Small-medium scale integrated technology utilization projects: Computerized socio-economic benefits assessment model.** Giammarino, L. (ENEA, Casaccia (Italy)); Sano', A.; Scarpitti, L. No corporate text available. May 1993. 95p. (In Italian). Quaderni Studi 19. Order Number DE94752606. Source: OSTI; NTIS (US Sales Only).

The computerized technology utilization project assessment model presented in this paper is aimed particularly at small and medium sized enterprises wishing to augment efficiency and production through the cost effective and socially acceptable implementation of innovative technologies. Developed by ENEA (the Italian Agency for New Technology, Energy and the Environment), the proposed flexible model reflects the broad experience gained by this national agency in conducting, for several years now, technology transfer and industrial in-plant energy efficiency monitoring support programs. While illustrating the theoretical decision making criteria forming the basis of the computerized assessment model, this paper also provides instructions for its correct application with the use of personal computers.

12418 (EUR–13541) **Improved energy efficiency in the process industries.** Pilavachi, P.A. (Commission of the European Communities, Brussels (Belgium)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. 307p. (In English, French). (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). Source: OSTI; NTIS (US Sales Only).

The European Commission, through the JOULE Programme, is promoting energy efficient technologies in the process industries; the topics of the various R and D activities are: heat exchangers (enhanced evaporation, shell and tube heat exchangers including distribution of fluids, and fouling), low energy separation processes (adsorption, melt-crystallization and supercritical extraction), chemical reactors (methanol synthesis and reactors with integral heat exchangers), other unit operations (evaporators, glass-melting furnaces, cement kilns and baking ovens, dryers and packed columns and replacements for R12 in refrigeration), energy and system process models (batch processes, simulation and control of transients and energy synthesis), development of advanced sensors.

12419 (EUR–13541, pp. 61-72) **The methodology of gas adsorption process design.** Macdonald, E.K. (UKAEA Harwell Lab. (United Kingdom)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0052-C (JR). (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

This project addresses the strategic R and D needs of the european process industries in the field of low energy separation processes, specifically the topic of gas adsorption. The coordinated research program is aimed at improving the energy efficiency of methods used to separate and recover gaseous products, or to eliminate pollutants before gases are released to the atmosphere. Considerations on selectivity and the range of adsorbents available are presented, and the various process configurations are reviewed. The tasks of the various participants to the project are detailed.

12420 (EUR–13541, pp. 73-86) **Improvement of melt crystallization's efficiency for industrial applications.** Arkenbout, G.J. (Nijverheidsorganisatie TNO, Apeldoorn (Netherlands)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0031-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

Melt crystallization appears to be an energy- and cost-efficient separation method for the ultra-purification of organic chemicals. The research project will focus on the investigation of the basic mechanisms of mass transfer between crystals and liquid to improve the separation efficiency of this new technology. The following topics will be studied: the mechanisms by which, and the process conditions under which, molecules of impurities are incorporated or included into crystal lattices; whether and under which conditions molecules of impurities can be transferred from the crystal phase to the melt. Various cases are considered: crystals in suspension as in a crystallizer, crystal layers grown on the wall of a heat exchanger, and crystals e.g. in a packed bed in crystal-liquid separation columns.

12421 (EUR–13541, pp. 87-98) **Phase equilibria and process simulation for high-pressure supercritical extraction processes.** Fredenslund, A. (Technical Univ. of Denmark, Lyngby (Denmark)); Soerensen, J.M. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0053-C. (CONF-9010554–: European seminar on improved energy

efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The objective of the study is to improve the understanding of low energy consuming processes using supercritical extraction to obtain pure alcohols and other oxy-organic compounds from aqueous mixtures. It includes: measurement of phase equilibria in mixtures with a supercritical solvent (e.g. carbon dioxide or propane), water, and an oxy-organic compound (ethanol, propanol or acetic acid); modelling of phase equilibria using equation of state with parameters based on the group-contribution approach; bench scale extraction experiments; steady state and dynamic simulation of extraction processes.

12422 (EUR–13541, pp. 141-159) **Energy saving and pollution abatement in glass-making furnaces, cement kilns and baking ovens.** Graca Carvalho, M. da (Instituto Superior Tecnico, Lisbon (Portugal). Lab. de Quimica Organica). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0051-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The aim of this project is to develop 'tools' to be used in the glass, cement and baking industries, that can lead to energy savings and pollution abatement. It will involve: computer-aided exploration of novel energy-saving and pollution abatement equipment and operational concepts; feasibility study for the development of control strategies and expert systems using mathematical models; application of sensors in harsh environments : development of infrared wall temperature sensors, of a Coriolis mass flow meter and flow rate regulator, and of a multi-sensor system for water vapour partial pressure, level of forced air circulation and crust colour (baking ovens).

12423 (EUR–13541, pp. 191-202) **Design and operation of energy efficient batch processes.** Kotjabasakis, E.; Brown, P.M.M.; Linnhoff, B. Commission of the European Communities, Luxembourg (Luxembourg). 1991. JOUE-0043-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The overall objective of the project is the development of an industrially useful and accepted procedure for the design and operation of energy efficient batch processes. However, the interactions between energy and the other important factors of batch processes such as process yields, plant utilization and product quality, will be also considered. Studies will combine process integration, batch scheduling, multi-product and multi-purpose batch processes, process simulation and process control. Schedule control algorithms developed in this project will ensure that the energy savings identified at the design stage can be fully realized in day-to-day plant operation. All the procedures developed will subsequently be brought together in a single computer software package.

12424 (EUR–13541, pp. 203-216) **Simulation and control of fast transients in process and utility systems.** Hutchinson, P. (Cranfield Inst. of Tech., Bedford (United Kingdom)); Gill, M.E. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0047-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The objective of the project is to develop models to simulate fast transients in process elements and utility networks, including controls, and to integrate them into a flow sheeting package of a form compatible with such dynamic simulation codes as SPEEDUP or CHEDYN. This will allow the management of process plant in a more optimally energy efficient way and thus lead to substantial energy savings, and more control and safety. The objectives will be achieved by developing fluid dynamic models for individual plant elements, control algorithms applicable to particular plant designs, and a general systems simulator. Validations will be made using data obtained from real process plants.

12425 (EUR–13541, pp. 217-227) **Energy synthesis in industrial processes.** Kalitventzeff, B. (Liege Univ. (Belgium). Inst. de Chimie). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0009-BE. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The aims of the project were to integrate available and developed technology for rational use of energy in the processing industry into a set of software, and strengthen the techniques and promote technology transfer through industrial case studies. The developed computer tools are SYNEP and EMS. SYNEP concerns the design of energy efficient plants and the retrofitting of existing ones. EMS is an aid for the optimal management of energy utility networks. Several industrial case studies have been performed in chemical processes, refineries, power-stations, in different european countries; substantial energy savings have been demonstrated.

12426 (EUR–13541, pp. 231-241) **Development of advanced sensors.** Durst, F. (Erlangen-Nuernberg Univ., Erlangen (Germany)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0056-C (MB). (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The present paper summarizes work to be carried out on the development of advanced sensors and their application to processes that are known to have high energy consumption but offer the possibility of energy savings when operated under controlled conditions. The aim of the proposed research and development work is to contribute to on-line sensor technology for the above purpose: mass and volume flow rate measurements using instruments applicable to single- and two-phase flows; humidity measurements in harsh environments; local measurements of temperature distributions using infra-red detectors; in-situ sensor systems to measure particle concentrations, particle size and particle velocity distributions; in-situ sensor systems to measure local temperature and concentration of chemical species; diagnostic instruments to study flow models.

12427 (KCL-KUITU–30) **Enzymes in refiner mechanical pulping: Final report.** Pere, J. (Technical Research Centre of Finland, Espoo (Finland). Biotechnical Lab.); Siika-aho, M.; Viikari, L. Finnish Pulp and Paper Research Inst., Espoo (Finland). 1993. 36p. (In Finnish). Order Number DE94722019. Source: OSTI; NTIS.

KUITU Research Programme.

The aim of the study was to investigate the effects of individual non-lignolytic enzymes on mechanical pulping. Main emphasis was to decrease the energy consumption of refining and to improve the handsheet properties by the enzymatic treatments. Cellulases and hemicellulases were produced and purified in pilot scale. Samples of spruce TMP pulps (CSF 350 - 800 ml) were obtained from a pilot refiner (KCL) and from a pulp mill (Tampella Forest Oy). For screening of enzymes hydrolysis experiments with different enzyme dosages, incubation times and pulp compositions (fractioned - non-fractioned) were carried out. Very low level of hydrolysis by individual purified enzymes were detected. As expected the carbohydrates solubilized increased as a function of enzyme dosage and incubation time. Laboratory experiments were performed in order to study the effects of enzymatic treatments on energy consumption of refining. Best results were obtained by a purified cellulase; in the subsequent refining 10 - 20 % less energy, as compared to the untreated controls, was needed to achieve a low freeness level. Handsheet properties of the enzymatically treated pulps were at least equal to or even slightly better as compared to the controls. The result show that individual enzymes, especially cellulases free of synergistic action can be efficiently used to the modification of carbohydrate structures of coarse mechanical pulp. This modification leads to energy savings and improvement of fibre properties such as flexibility.

12428 (KCP–613-5307) **Validation of the Environmentally Conscious Manufacturing Integrated Demonstration hardware: Final report.** Carter, R.D. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94003824. Source: OSTI; NTIS; GPO Dep.

This paper describes electrical and environmental testing that were performed on the Environmentally Conscious Manufacturing Integrated Demonstration (ECM ID) units. An analysis of the testing data comparing the ECM units with units processed using traditional processes showed that there was no statistical difference in functional performance or reliability.

12429 (ORNL/TM–12499) **Transphase cool storage test report.** Stovall, T.K. Oak Ridge National Lab., TN (United States). Dec 1993. 44p. Sponsored by Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. Order Number DE94004930. Source: OSTI; NTIS; GPO Dep.

The Ice Storage Test Facility (ISTF) is designed to test commercial cool storage systems. Transphase, Inc. provided a prototype of a new storage tank design equipped with coils designed for use with a secondary fluid system and filled with a eutectic designed to freeze at 41°F. The Transphase cool storage system was tested over a wide range of operating conditions. Measured system performance during charging showed the ability to freeze the tank with relatively constant brine temperatures over most of the charging cycle. During discharge cycles, the storage tank outlet temperature was governed mainly by the brine flow rate and the tank's remaining charge. The discharge capacity was dependent upon both the selected discharge rate and maximum allowable tank outlet temperature. This prototype unit experienced several operational problems, not unexpected for the first full-size execution of a new design. Such prototype testing was one of EPRI's primary goals in founding the ISTF.

12430 (PNL–9002) **Information resources for US Department of Energy pollution prevention programs.** Peterson, K.L.; Snowden-Swan, L.J.; Butner, R.S. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006677. Source: OSTI; NTIS; GPO Dep.

In support of the US Department of Energy's (DOE's) pollution prevention efforts being conducted under the aegis of DOE's Office of Environmental Restoration and Waste Management (EM) program, Pacific Northwest Laboratory was tasked with evaluating pollution prevention information resources. The goal of this activity was to improve the effectiveness of DOE's pollution prevention activities through improved information flow, both within the complex, and more specifically, between DOE and other organizations that share similar pollution prevention challenges. This report presents our findings with respect to the role of information collection and dissemination within the complex, opportunities for teaming from successes of the private sector, and specific information needs of the DOE pollution prevention community. These findings were derived from a series of interviews with pollution prevention coordinators from across the DOE complex, review of DOE site and facility pollution prevention plans, and workshops with DOE information users as well as an information resources workshop that brought together information specialists from private industry, non-profit organizations, as well as state and regional pollution prevention assistance programs.

12431 (PNL-SA–22193-Vol.1) **Proceedings of waste stream minimization and utilization innovative concepts: An experimental technology exchange: Volume 1, Industrial solid waste processing municipal waste reduction/recycling.** Lee, V.E. (ed.); Watts, R.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-930475–Vol.1: Waste stream minimization and utilization innovative concepts - an experimental technology exchange, Austin, TX (United States), 22-23 Apr 1993). Order Number DE94007489. Source: OSTI; NTIS; GPO Dep.

This two-volume proceedings summarizes the results of fifteen innovations that were funded through the US Department of Energy's Innovative Concept Program. The fifteen innovations were presented at the sixth Innovative Concepts Fair, held in Austin, Texas, on April 22–23, 1993. The concepts in this year's fair address innovations that can substantially reduce or use waste streams. Each paper describes the need for the proposed concept, the concept being proposed, and the concept's economics and market potential, key experimental results, and future development needs. The papers are divided into two volumes: Volume 1 addresses innovations for industrial solid waste processing and municipal waste reduction/recycling, and Volume 2 addresses industrial liquid waste processing and industrial gaseous waste processing. Selected papers have been indexed separately for inclusion in the Energy Science and Technology Database.

12432 (PNL-SA–22193-Vol.2) **Proceedings of waste stream minimization and utilization innovative concepts: An experimental technology exchange: Volume 2, Industrial liquid waste processing, Industrial gaseous waste processing.** Lee, V.E. (ed.); Watts, R.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-930475–Vol.2: Waste stream minimization and utilization innovative concepts - an experimental technology exchange, Austin, TX (United States), 22-23 Apr 1993). Order Number DE94007490. Source: OSTI; NTIS; GPO Dep.

This two-volume proceedings summarize the results of fifteen innovations that were funded through the US Department of Energy's Innovative Concept Program. The fifteen innovations were presented at the sixth Innovative Concepts Fair, held in Austin, Texas, on April 22–23, 1993. The concepts in this year's fair address innovations that can substantially reduce or use waste streams. Each paper describes the need for the proposed concept, the concept being proposed, and the concept's economics and market potential, key experimental results, and future development needs. The papers are divided into two volumes: Volume 1 addresses innovations for industrial solid waste processing and municipal waste reduction/recycling, and Volume 2 addresses industrial liquid waste processing and industrial gaseous waste processing. Individual reports are indexed separately.

12433 (PNL-SA–23457) **Separations techniques for recovery and/or removal of toxic metals from spent textile dyebaths.** Babocsi, E.E. (North Carolina State Univ., Raleigh, NC (United States)); Hallen, R.T. Pacific Northwest Lab., Richland, WA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006214. Source: OSTI; NTIS; GPO Dep.

The Textile Resource Conservation Project (TReC) is a major initiative of the American Textile Partnership (AMTEX) focusing on energy and the environment. The largest proposed project in the TReC is Raw Material Recovery and Reuse. The main task within the Raw Material Recovery and Reuse Project is Textile Chemical Recovery. The initial focus of this task is the separation/removal of colorants from solution. Screening studies were performed at a number of US Department of Energy National Laboratories to identify promising technologies for the treatment and recovery of dyes containing toxic metals. These dyes were chosen because of the environmental concern associated with their disposal. The research group at Pacific Northwest Laboratory (PNL) took two approaches to the removal and recovery of the toxic metals in the dyes. One approach was to react or destroy the organic fraction of the dye, releasing the metals for conventional separation such as ion exchange. PNL evaluated the Rapid Thermal Decomposition of precursors in Solution (RTDS) and Corona Discharge processes for metal release. The other approach was to separate and concentrate the dye, metal-complex intact, from the bulk of the spent solution. Membrane separation was evaluated for recovery of the dyes with the metals left intact. The RTDS process was found to be effective for destroying color and releasing or precipitating metals for recovery. Corona Discharge was effective at selectively destroying color, but the metals were not sufficiently released to allow recovery with a chelating resin. Ultrafiltration membranes were

effective for separating and recovering the metal-containing dye as a potentially reusable concentrated stream.

12434 (SAND–93-3961C) **Pulsed power systems for environmental and industrial applications.** Neau, E.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931048–1: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94005101. Source: OSTI; NTIS; GPO Dep.

The development of high peak power simulators, laser drivers, free electron lasers, and Inertial Confinement Fusion drivers is being extended to high average power short-pulse machines with the capabilities of performing new roles in environmental cleanup and industrial manufacturing processes. We discuss a new class of short-pulse, high average power accelerator that achieves megavolt electron and ion beams with 10's of kiloamperes of current and average power levels in excess of 100 KW. Large treatment areas are possible with these systems because kilojoules of energy are available in each output pulse. These systems can use large area x-ray converters for applications requiring greater depth of penetration such as food pasteurization and waste treatment. The combined development of this class of accelerators and applications, at Sandia National Laboratories, is called Quantum Manufacturing.

12435 (TKK-V-C–122) **New iron- and steelmaking technologies: Final report.** Holappa, L.; Xu, Shuang. Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Metallurgy. 1993. 14p. (In Finnish). Order Number DE94722012. Source: OSTI; NTIS.

SULA Research Programme.

New ironmaking technologies, based on smelting reduction principle, are intensively developed a.o. in Japan, Australia and United States. The first commercial unit which was initially studied in Europe is now in operation in South Africa. In this project, new developments were examined and compared with the blast furnace process. The results showed that energy consumption can be reduced and the energy costs can be remarkably lowered. Coal injection in blast furnace was surveyed and its effects on BF operation were analyzed. A physicochemical heat and mass balance model was constructed and used to analyze the effects of process parameters and to find optimum combinations. In the experimental part a sophisticated X-ray device was developed. It was utilized to follow heating and melting of iron oxide pellets. New technologies in scrap melting were reviewed and their energy consumptions were compared. Within the project contacts were created to all significant projects in the field of smelting reduction which will assure following the progress also in the future.

12436 (TKK-V-C–123) **Better utilization of Cr-containing materials: Final report.** Holappa, L.; Xiao, Yanping. Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Metallurgy. 1993. 24p. (In Finnish). Order Number DE94722013. Source: OSTI; NTIS.

SULA Research Programme.

The aim of the project 'Better utilization of Cr-containing materials' was to save energy in ferrochromium and stainless steelmaking production by improving chromium yield and process efficiency. The main objective of the study was to measure activities of chromium oxides in process type slags. In this study, it could be determined first time, activities of chromium oxides at extended composition range. The results give a basis for construction of a more general model for chromium containing slags. By applying these results the chromium losses in the processes can be reduced and thus the energy and production costs can be lowered. Summarization of the slag studies, their results and eventual applications are shown as Appendix. Further, the project has included modelling and assessment of thermodynamic properties of iron-chromium based metal melts, survey of ferrochromium production technologies with energy consumptions and future trends as well as constructing of a calculation program for nitrogen pick up and removal in AOD-process.

12437 (UCRL-JC–114578) **Scrap uranium recycling via electron beam melting.** McKoon, R. Lawrence Livermore National Lab., CA (United States). Nov 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9311151–2: 1993 electron beam melting and refining state of the art, Reno, NV (United States), 5 Nov 1993). Order Number DE94006725. Source: OSTI; NTIS; INIS; GPO Dep.

A program is underway at the Lawrence Livermore National Laboratory (LLNL) to recycle scrap uranium metal. Currently, much of the material from forging and machining processes is considered radioactive waste and is disposed of by oxidation and encapsulation at significant cost. In the recycling process, uranium and uranium alloys in various forms will be processed by electron beam melting and continuously cast into ingots meeting applicable specifications for virgin material. Existing vacuum processing facilities at LLNL are in compliance with all current federal and state environmental, safety and health regulations for the electron beam melting and vaporization of uranium metal. One of these facilities has been retrofitted with an auxiliary electron beam gun system, water-cooled hearth, crucible and ingot puller to create an electron beam melt furnace. In this furnace, basic process R&D on uranium recycling will be performed with the goal of eventual transfer of this technology to a production facility.

12438 (UCRL-JC–115709) **Waste minimization at Lawrence Livermore National Laboratory: A case study of environmentally conscious manufacturing.** Steffani, C.P.; Dini, J.W. Lawrence Livermore National Lab., CA (United States). Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9303255–1: 207. American Chemical Society (ACS) national meeting, San Diego, CA (United States), 13-18 Mar 1993). Order Number DE94007076. Source: OSTI; NTIS; GPO Dep.

The purpose of this paper is to provide an update on what we've accomplished and have planned in our plating operation at Lawrence Livermore National Laboratory (LLNL) in the area of waste minimization. Our efforts have included issues other than waste minimization and, therefore, fall under the wider umbrella entitled pollution prevention or environmentally conscious electroplating. Approximately one year has passed since our last report on pollution prevention and since this topic remains a high-effort activity much more has been accomplished. Our efforts to date fall under the first two generation categories of waste reduction. Good housekeeping practices, inventory control, and minor changes in operating practices (first generation) resulted in an impressive amount of waste reduction. In the second generation of waste reduction, current technology, separation technologies, and material substitutions were used to reduce emission and wastes. The third generation of improvements requires significant technological advances in process synthesis and engineering. We are presently starting some projects in this third generation phase and these will be discussed at the end of this paper.

12439 (VTT-SAH–9/93) **Application of knowledge-based technology to energy management systems in the steel and base metals industry: Final report.** Koponen, P. Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering. 1993. 43p. (In Finnish). Order Number DE94721994. Source: OSTI; NTIS.

SULA Research Programme.

This report presents the results of a project for improving the application of knowledge based techniques to energy-efficient steel and metal production. One objective of the project was to build systems that help reduce the energy costs by using expert systems and other knowledge based techniques. The other was to teach the participants knowledge engineering. In the project we have considered several potential applications and chosen the following four: a hyper text based advisory system that provides knowledge of the steel making processes; short term energy management and power prediction of several steel and base metal plants; scheduling of the operation of a steel plant and modelling the evolution of steel temperature in a continuous easter tundish. In different parts of this project some popular expert system shells, hypertext, object oriented programming, rapid prototyping, fuzzy modelling and artificial neural nets have been applied among more conventional programming techniques. In all these applications prototype systems have been completed and now outside the project several production versions are under development. This is the final report

of the project. The project and its results are described. The experience is discussed and applications for future research suggested.

12440 (VTT-TIED–1455) **Speciation in water and soil: A literature review.** Carlsson, T. Technical Research Centre of Finland, Espoo (Finland). 1993. 70p. Order Number DE94722005. Source: OSTI; NTIS.

It is well known that the study of environmental pollution should be focused on the chemical forms of pollutants rather than on total concentrations. The need for more research on elemental speciation increases as pollutants are constantly released into the air, water and soil. The present report is the result of a literature review which was made as a part of the 'Speciation project' at the Reactor Laboratory of the Technical Research Centre of Finland. Work on elemental speciation associated with environmental pollution includes several other topics in addition to speciation. The work focuses mainly on heavy metal pollution in Finnish soil/water systems. The following topics are dealt with: The geology and geochemistry of Finland, pollution, chemical time bombs (CTBs),computer modelling, and speciation.

3206 Municipalities and Community Systems

Refer also to citation(s) 11914, 12168, 12431, 12432

12441 (DOE/CE/26615–T1) **Optimization of the engineering design for the Lansing District Cooling System by comparative analysis of the impact of advanced technologies on a conventional design approach: Volume 1.** Lansing Board of Water and Light, MI (United States). [1994]. 177p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-91CE26615. Order Number DE94007016. Source: OSTI; NTIS; GPO Dep.

The Lansing Board of Water and Light (LBWL) began investigating development of a cooling district in the Lansing Downtown in 1989 in order to retain and build summer load for its steam utility. A feasibility study was conducted in conjunction with SFT, Inc. and ZBA, Inc. which addressed many factors such as marketability of the product, impact on the summer steam load, distribution system development, system design, probable capital and operating costs, reliability and environmental and other regulatory impacts on a preliminary feasibility basis. The Phase I study completed in September of 1989 provided highly promising results for establishing a District Cooling System (DCS). An existing chilled water production facility owned by the State of Michigan was identified as a potential location for a DCS plant. With these changes a review of the feasibility with a new set of alternatives and sensitivities was evaluated. This enhancement to the Phase I Study was nearing completion when the LBWL in conjunction with Energy, Mines and Resources Canada proposed to conduct the Phase II project in conjunction with DOE. The project was structured to proceed along a dual track to demonstrate the impact of the application of various innovative technologies.

12442 (DOE/CH/10093–246) **Tomorrow's energy today for cities and counties – Alternative wastewater treatment: Advanced Integrated Pond systems.** National Renewable Energy Lab., Golden, CO (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE93018228. Source: OSTI; NTIS; GPO Dep.

This report provides a discussion of the design, construction, operation, and maintenance of the Advanced Integrated Pond System as an alternative for other more costly municipal waste water treatment plants.

12443 (DOE/EH–231-036/0793) **Closure of municipal solid waste landfills (MSWLFs): RCRA Information Brief.** Petts, M. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div. Jul 1993. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008206. Source: OSTI; NTIS; GPO Dep.

This RCRA (Resource Conservation and Recovery Act) information brief answers some questions regarding the 40 CFR 258 and 40 CFR 257 regulations on solid waste disposal facilities and their closure/cover. Section 405 of the Clean Water Act is covered as well as the RCRA.

12444 (DOE/FTR–94004452) **Travel to Europe to examine waste management practices in Germany and Sweden: Foreign trip report, October 17–November 17, 1993.** Worster, E.S. National Renewable Energy Lab., Golden, CO (United States). 17 Dec 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-83CH10093. Order Number DE94004452. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Focus of the trip to Germany was to evaluate integrated municipal solid waste management practices and systems in Germany, with particular emphasis on the Dualles system established in response to the Packaging Ordinance implemented in 1991. Intent of the trip was to observe specific municipal solid waste management facilities and programs; examine setting of environmental standards, status of compliance efforts, including technology changes and enforcement measures implemented; and examine impact of the packaging program on other components of integrated waste management systems. Focus of the trip to Sweden was to examine the legislative and regulatory situation in Sweden regarding integrated waste management, with particular emphasis on regulation of organic compound emissions from waste-to-energy facilities.

12445 (NEI-FI–216) **Model for calculating a financial situation of a municipality-owned energy utility: Final report.** Energia-Ekono, Espoo (Finland). 1993. 82p. (In Finnish). Order Number DE94721993. Source: OSTI; NTIS.

Subproject in the District Heat Research Programme coordinated by Finnish District Heating Association.

The goal of this project was to develop a model (income statement, balance sheet and financing budget) for calculating a financial situation of a municipality-owned energy utility. The project also determines how to move to the new calculation method and how the profit from the energy utility to the municipality should be defined. The main features of the calculation model developed for a municipality owned utility correspond to the accounting principles of limited companies with the exceptions that share capital corresponds to utility capital and dividend corresponds to return on utility capital. Connection to the budget of the municipality is obtained through the municipality's profit demands to the energy utility. The problem greater than the principles of the calculation method is, however, how to move to the new model, i.e., how assets should be valued and how the investment of the municipality in the energy utility should be determined. The municipality's investment in an energy utility is determined by the cash flow based on revenues and expenses incurred in the past according to the cost price principle. The investment indicated by the cash flow is divided in the opening balance sheet into utility capital and debt in such a manner that the interests of the municipality are taken into account and that the financial structure of the energy board remains sound.

12446 (PNL–8834) **Impact evaluation of lighting retrofit projects at Boeing Commercial Airplane Group under The Energy $avings Plan.** Sullivan, G.P.; Oens, M.A.; Spanner, G.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94008057. Source: OSTI; NTIS; GPO Dep.

This impact evaluation of two lighting retrofit projects that were recently installed at Boeing Commercial Airplane Group (Boeing) was conducted for the Bonneville Power Administration (Bonneville) as part of an evaluation of its Energy $avings Plan (E$P) Program. The first project was a light-fixture and lighting control retrofit, consisting of five individual measures installed in Building 40-05. The second project was a retrofit of all parking lot lighting on the site. The objective of this impact evaluation was to assess how much electrical energy is being saved at Boeing as a result of the E$P projects and to determine how much the savings cost Bonneville and the region. The impact of the project was evaluated with a combination of engineering analysis, financial analysis, interviews, and submittal reviews (Boeing's proposals and completion reports).

12447 (PNL–8879) **Impact evaluation of adjustable speed drives installed at Great Western Malting Company under the Energy $avings Plan.** Brown, D.R.; Spanner, G.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-76RL01830. Order Number DE94008043. Source: OSTI; NTIS; GPO Dep.

This impact evaluation of adjustable speed drives (ASDs) that were recently installed at Great Western Malting Company (GWM) was conducted for the Bonneville Power Administration (Bonneville) as part of an evaluation of its Energy $avings Plan (E$P) Program. The project consists of four ASDs that are used to control the power to motors driving kiln exhaust fans. The ASDs are being used to control the air flow rate through the compartment house malt drying kilns, which was previously controlled with dampers. The objective of this impact evaluation was to assess how much electrical energy is being saved at GWM as a result of the E$P and to determine how much the savings cost Bonneville and the region. The impact of the project was evaluated with a combination of engineering analysis, financial analysis, interviews, and submittal reviews (GWM's proposal and completion report).

33 ADVANCED PROPULSION SYSTEMS

3301 Internal Combustion Engines

12448 (DOE/METC–93/6132, pp. 222-235) **Coal-fueled diesel engines for locomotive applications.** Hsu, B.D.; Najewicz, D.J.; Cook, C.S. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

The objective of this program is to develop the technology necessary for future commercialization of a coal-fueled diesel locomotive. The engine under development is a medium speed diesel (1050 rpm) that operates at 250 hp per cylinder in locomotive applications. The economic assessment study examined seven areas and their economic impact on the use of coal fueled diesels. These areas included impact on railroad infrastructure, expected maintenance cost, environmental considerations, impact of higher capital costs, railroad training and crew costs, beneficiated coal costs for viable economics, and future cost of money. The technical feasibility study examined the combustion of CWS through lab and bench scale experiments. The major accomplishments from this study have been the development of CWS injection hardware, the successful testing of CWS fuel in a full size, single cylinder, medium speed diesel engine, evaluation of full scale engine wear rates with metal and ceramic components, and the characterization of gaseous and particulate emissions.

12449 (DOE/METC–93/6132, pp. 327-333) **Particulate control for coal-fueled diesel engine exhaust.** Smolensky, L.A.; Easom, B.H. USDOE Morgantown Energy Technology Center, WV (United States). Aug 1993. (CONF-930893–: Joint contractors meeting on advanced turbine systems, fuel cells and coal-fired heat, Morgantown, WV (United States), 3-5 Aug 1993). In *Proceedings of the joint contractors meeting: FE/EE Advanced Turbine Systems conference FE fuel cells and coal-fired heat engines conference.* 499p. Order Number DE93011308. Source: OSTI; NTIS.

In this program, a high-temperature Core Separator system will be developed as a particulate control device for coal-fueled diesel engine exhaust. The Core Separator is a unique concept, which has been conceived and patented as a low-temperature mechanical collector. Several Core Separator configurations were tested at low temperatures in 1989-1991 within the scope of an SBIR program with the DOE. The device has the ability to extract fine particulates from gas streams and its performance significantly exceeds conventional cyclonic collectors. The Core Separator as a low-temperature mechanical collector is able to remove a substantial amount of submicron particles from flue gas and essentially all particles larger than 2-3 microns in diameter. In this regard, it is comparable to a medium efficiency electrostatic precipitator. Yet, the Core Separator retains most of the advantages of mechanical collectors, such as simplicity, self-cleaning ability, reliability, ability to handle high solids concentration, low capital and maintenance cost, etc.

12450 (DOE/NASA–0373-1) **Development of high temperature liquid lubricants for low-heat rejection heavy duty diesel engines.** Wiczynski, T.A.; Marolewski, T.A. Cummins Engine Co., Inc., Columbus, IN (United States). Mar 1993. 75p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AI01-91CE50306. (NASA-CR–191197). Order Number DE94007379. Source: OSTI; NTIS; GPO Dep.

Objective was to develop a liquid lubricant that will allow advanced diesel engines to operate at top ring reversal temperatures approaching 500 C and lubricant sump temperatures approaching 250 C. Base stock screening showed that aromatic esters and diesters has the lowest deposit level, compared to polyol esters, poly-alpha-olefins, or refined mineral oil of comparable viscosity. Classical aryl and alkyl ZDP antiwear additives are ineffective in reducing wear with aromatic esters; the phosphate ester was a much better antiwear additive, and polyol esters are more amenable to ZDP treatment. Zeolites and clays were evaluated for filtration.

12451 A coal-water slurry fueled internal combustion engine and method for operating same. McMillian, M.H. To Dept. of Energy. 1992. U.S. patent application 7-851,390. 21p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007330. Source: OSTI; NTIS; GPO Dep.

An internal combustion engine fueled with a coal-water slurry is described. About 90 percent of the coal-water slurry charge utilized in the power cycle of the engine is directly injected into the main combustion chamber where it is ignited by a hot stream of combustion gases discharged from a pilot combustion chamber of a size less than about 10 percent of the total clearance volume of main combustion chamber with the piston at top dead center. The stream of hot combustion gases is provided by injecting less than about 10 percent of the total coal-water slurry charge into the pilot combustion chamber and using a portion of the air from the main combustion chamber that has been heated by the walls defining the pilot combustion chamber as the ignition source for the coal-water slurry injected into the pilot combustion chamber.

3303 Electric-Powered Systems

Refer also to citation(s) 12292, 12374, 12410, 12456

12452 (EGG-EP–10948) **Preliminary evaluation of the University of South Florida Mobile Data Acquisition System, the Idaho National Engineering Laboratory Versatile Data Acquisition System, and the Autologger Vehicle User Survey System produced by Instrumental Solutions of Ottawa, Canada for the Site Operator Program Field Data Collection.** Kiser, D.M.; Richardson, R.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008514. Source: OSTI; NTIS; GPO Dep.

The Electric Vehicle (EV) Site Operator Program, is currently composed of thirteen Site Operators. In addition to operating electric vehicles for demonstration of the technology, the Site Operators also perform operational field testing. Data collected by the programs are input to the Site Operator Database at each site and transmitted, periodically, to the database at the INEL. As the program has expanded, some Site Operators have begun operating vehicles at sites remote from their offices. With the advent of these expanded test programs, it is necessary to consider in-vehicle, automated data acquisition systems. Three of these in-vehicle, data acquisition systems have been designed and constructed: The Mobile Data Acquisition System (MDAS) was designed and constructed by Sigma TecSystems, Inc. located in Tampa, Florida. The Versatile Data Acquisition System (VDAS) was designed and constructed at the INEL under the guidance of the Electric and Hybrid Vehicle (EHV) Program. The AUTOLOGGER Vehicle User Survey System produced by Instrumental Solutions of Ottawa, ON. Because the USF MDAS is a new system proposed for use by the Site Operator Program, the purpose of this report is to provide a preliminary evaluation of the MDAS by comparing the system to the

proven VDAS. Data used to perform the comparison was acquired by a review of the MDAS literature provided by the USF, and by a demonstration of the MDAS and its performance, provided by the USF to INEL personnel. A brief discussion of the AUTOLOGGER is also included, for comparison, because it is being used by Southern California Edison (SCE), one of the Site Operator Program participants who recommends the unit as a good system.

12453 (EGG-EP–10999) **EDD-7 Electric Charge Point Meter test results.** Mersman, C.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1993. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008515. Source: OSTI; NTIS; GPO Dep.

The results of tests evaluating the electric switching portion of the EDD-7 Electric Charge Point Meter (ECPM) are presented. The ECPM is a modified parking meter that allows the purchase of 120 or 240 volt electric power. The ECPM is designed to make electricity available at any vehicle parking location. The test results indicate that the ECPM operated without failure thru a series of over current and ground fault tests at three different test temperatures. The magnitude of current required to trip the over current protection circuitry varied with temperature while the performance of the ground fault interruption circuitry did not change significantly with the test temperature.

12454 (LA-UR–94-659) **Polymer electrolyte fuel cells.** Gottesfeld, S. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940210–1: 11. international seminar on primary and secondary battery technology and application, Deerfield Beach, FL (United States), 28 Feb - 3 mar 1994). Order Number DE94007558. Source: OSTI; NTIS; GPO Dep.

The recent increase in attention to polymer electrolyte fuel cells (PEFCs) is the result of significant technical advances in this technology and the initiation of some projects for the demonstration of complete PEFC-based power system in a bus or in a passenger car. A PEFC powered vehicle has the potential for zero emission, high energy conversion efficiency and extended range compared to present day battery powered EVs. This paper describes recent achievements in R&D on PEFCs. The major thrust areas have been: (1) demonstration of membrane/electrode assemblies with stable high performance in life tests lasting 4000 hours, employing ultra-low Pt loadings corresponding to only 1/2 oz of Pt for the complete power source of a passenger car, (2) effective remedies for the high sensitivity of the Pt electrocatalyst to impurities in the fuel feed stream, and (3) comprehensive evaluation of the physicochemical properties of membrane and electrodes in the PEFC, clarifying the water management issues and enabling effective codes and diagnostics for this fuel cell.

12455 (UCRL-JC–115382) **Promising future energy storage systems: Nanomaterial based systems, Zn-air and electromechanical batteries.** Koopman, R.; Richardson, J. Lawrence Livermore National Lab., CA (United States). Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310282–2: Workshop on advanced components for electric and hybrid electric vehicles, Gaithersburg, MD (United States), 27-28 Oct 1993). Order Number DE94007443. Source: OSTI; NTIS; GPO Dep.

Future energy storage systems will require longer shelf life, higher duty cycles, higher efficiency, higher energy and power densities, and be fabricated in an environmentally conscious process. This paper describes several possible future systems which have the potential of providing stored energy for future electric and hybrid vehicles. Three of the systems have their origin in the control of material structure at the molecular level and the subsequent nanoengineering into useful device and components: aerocapacitors, nanostructure multilayer capacitors, and the lithium ion battery. The zinc-air battery is a high energy density battery which can provide vehicles with long range (400 km in autos) and be rapidly refueled with a slurry of zinc particles and electrolyte. The electromechanical battery is a battery-sized module containing a high-speed rotor integrated with an iron-less generator mounted on magnetic bearings and housed in an evacuated chamber.

3304 Hybrid Systems

Refer also to citation(s) 12452, 12455

12456 (UCRL-JC–115425) **The hydrogen hybrid option.** Smith, J.R. Lawrence Livermore National Lab., CA (United States). 15 Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310282–1: Workshop on advanced components for electric and hybrid electric vehicles, Gaithersburg, MD (United States), 27-28 Oct 1993). Order Number DE94006733. Source: OSTI; NTIS; GPO Dep.

The energy efficiency of various piston engine options for series hybrid automobiles are compared with conventional, battery powered electric, and proton exchange membrane (PEM) fuel cell hybrid automobiles. Gasoline, compressed natural gas (CNG), and hydrogen are considered for these hybrids. The engine and fuel comparisons are done on a basis of equal vehicle weight, drag, and rolling resistance. The relative emissions of these various fueled vehicle options are also presented. It is concluded that a highly optimized, hydrogen fueled, piston engine, series electric hybrid automobile will have efficiency comparable to a similar fuel cell hybrid automobile and will have fewer total emissions than the battery powered vehicle, even without a catalyst.

3305 Flywheel Propulsion

Refer also to citation(s) 12290

3307 Emission Control

12457 (KFK-PEF–102) **Separation of diesel soot particles with a combination of an agglomerator and a centrifugal separator.** Wadenpohl, C. (Karlsruhe Univ. (T.H.) (Germany). Inst. fuer Mechanische Verfahrenstechnik und Mechanik); Loeffler, F. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF). Mar 1993. 102p. (In German). Project Number PEF 89/007/3. Order Number DE94752366. Source: OSTI; NTIS (US Sales Only).

This research project deals with the separation of soot particles from diesel engine exhaust fumes using a two-stage separation system which consists of an electrostatic agglomerator and a cyclone. The agglomerator is a tubular electrostatic precipitator with a cylindrical collector and a specially-shaped corona discharge electrode. The size distribution of the agglomerates together with the collection grade efficiency of the cyclone determine the total collection efficiency of the separation system. Hence an optimization of the separation system is either possible by improving the agglomerator or the separation of the agglomerates in the cyclone. The investigations of the agglomerator showed that its effectivity distinctly decays with increasing engine load. At partial load the agglomerates in a size range above 5 μm contain up to 90% of the particle mass. At full load the agglomerator exerts only a weak influence on the size distribution. (orig./HW). 62 figs., 8 tabs., 48 refs.

3308 Alternative Fuels

Refer also to citation(s) 11893, 12451, 12456

12458 (NEI-FI–214, pp. 117-121) **Fuel ethanol for oxygenated gasoline in Finland.** Petaejae, T. (Alko Oy, Rajamaeki (Finland)). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Alternative fuels have recently emerged as one possible solution for difficult air pollution problems round the world, particularly in large cities. Environmental, industrial, agricultural and economical reasons and connections to international environmental programs have reactivated the biofuel research in Finland. Ethanol is the most widely used alternative transportation fuel in the world. Oxygenation of all the Finnish gasoline up to 2.0 % oxygen level would require 115 000 mt/a ethanol and 255 000 mt/a ETBE. Based on

raw material quantities, transportation, existing production capacities and markets for the DDGS, the investigations and traffic trials made at Alko Oy. showed that the primary ethanol demand would be 60 000 t/a consuming 240 000 tons of barley/a, which equals to the production area of 67 000 ha. The use of ethanol in oxygenated gasoline via ETBE production and ETBE/ethanol blending has and will be calculated and tested in many-sided traffic trials and laboratory engine tests taking place in Finland in 1991-1992. The main targets of the traffic trials are to optimize the oxygen level for Finnish circumstances, to test the quantities of ethanol, that are safe to be added into gasoline in the refinery and to analyse regulated and non-regulated components in exhaust gases.

12459 (NEI-FI–214, pp. 123-133) **Alcohols and ethers for improving air quality.** Nylund, N.O. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Fuel and Process Technology). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

Alcohols and ethers are clean burning fuels or fuel components which can reduce the emissions, especially CO and HC emissions, significantly. The easiest way to use oxygenates is to use them as gasoline components, not as high concentration fuels. Ethers are easier to use than alcohols. Just adding (splash-blending) oxygenates is not enough for reformulation. Also the base gasoline must be altered to work with oxygenates. Flexible-fuel vehicles are a transitional stage between hydrocarbon gasoline and pure alcohol fuel. In heavy-duty applications, alcohols will have to compete with gaseous fuels. The future of alcohols will depend on taxation of biofuel/biocomponents. If biofuels are treated as normal fuels, they cannot be competitive due to high production costs. Also possible limitations on fossil CO_2 emissions must be considered as an decisive point to usage of biofuels/biocomponents.

35 ARMS CONTROL

Refer also to citation(s) 12749

12460 (UCRL-ID–116207) **A simple method for rapidly processing HEU from weapons returns.** McLean, W. II; Miller, P.E. Lawrence Livermore National Lab., CA (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008308. Source: OSTI; NTIS; GPO Dep.

A method based on the use of a high temperature fluidized bed for rapidly oxidizing, homogenizing and down-blending Highly Enriched Uranium (HEU) from dismantled nuclear weapons is presented. This technology directly addresses many of the most important issues that inhibit progress in international commerce in HEU; viz., transaction verification, materials accountability, transportation and environmental safety. The equipment used to carry out the oxidation and blending is simple, inexpensive and highly portable. Mobile facilities to be used for point-of-sale blending and analysis of the product material are presented along with a phased implementation plan that addresses the conversion of HEU derived from domestic weapons and related waste streams as well as material from possible foreign sources such as South Africa or the former Soviet Union.

3501 Policy, Negotiations, and Legislation

Refer also to citation(s) 12328, 12466

12461 (INIS-mf–13812) **Resolution 825 (1993). Adopted by the Security Council at its 3212th meeting, on 11 May 1993.** United Nations, New York, NY (USA). 11 May 1993. 2p. (S/RES–825(1993).). Order Number DE94618335. Source: OSTI; NTIS (US Sales Only); INIS.

The United Nations Security Council Resolution 825, adopted on 11 May 1993, deals with the intention of the Government of the Democratic Peoples' Republic of Korea to withdraw from the Treaty on the Non-proliferation of Nuclear Weapons and the report of the Director-General of the IAEA (S/25556).

12462 (INIS-mf–13813) **Documents of the first committee. Note by the Secretariat. Addendum: General Assembly 48. session, first committee.** United Nations, New York, NY (USA). 19 Nov 1993. 15p. (A/C–1/48/INF/1(Add.2).). Order Number DE94618336. Source: OSTI; NTIS (US Sales Only); INIS.

The document contains agenda items, concerning in particular the following issues: verification in all its aspects, including the role of the United Nations in the field of verification; amendment of the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water; comprehensive nuclear-test-ban treaty; establishment of a nuclear-weapon-free zone in the region of the Middle East, in South Asia; conclusion of effective international agreements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons; general and complete disarmament; prohibition of the dumping of radioactive wastes; convention on the Prohibition of the Use of Nuclear Weapons; nuclear-arms freeze; consolidation of the regime established by the Treaty of Tlatelolco; implementation of the declaration on the denuclearization of Africa.

12463 (INIS-mf–13814) **Process of nuclear disarmament in the framework of international peace and security, with the objective of the elimination of nuclear weapons. Regional approach to disarmament within the context of global security: General assembly. Disarmament Commission, 1993 substantive session, New York, 19 April-10 May 1993. Agenda items 4 and 5.** Steward, V.R.W. United Nations, New York, NY (USA). 26 Apr 1993. 7p. (A/CN–10/179.). Order Number DE94618337. Source: OSTI; NTIS (US Sales Only); INIS.

The letter informs on transmission to the Disarmament Commission of the text of a speech delivered by the State President of South Africa, Mr. F.W. de Klerk, to a joint session of Parliament on 24 March 1993, announcing developments relating to South Africa's nuclear capability and accession to the Treaty on the Non-Proliferation of Nuclear Weapons.

12464 (INIS-mf–13814, pp. 2-7) **Nuclear non-Proliferation treaty: Speech to a joint session of Parliament, 24 March 1993.** Klerk, F.W. de. United Nations, New York, NY (USA). 26 Apr 1993. 7p. (A/CN–10/179.). In *Process of nuclear disarmament in the framework of international peace and security, with the objective of the elimination of nuclear weapons. Regional approach to disarmament within the context of global security: General assembly. Disarmament Commission, 1993 substantive session, New York, 19 April-10 May 1993. Agenda items 4 and 5.* Order Number DE94618337. Source: OSTI; NTIS (US Sales Only); INIS.

The text of a speech is presented delivered by the State President of South Africa, Mr. F.W. de Klerk, to a joint session of Parliament on 24 March 1993, announcing developments relating to South Africa's nuclear capability and accession to the Treaty on the Non-Proliferation of Nuclear Weapons.

3502 Proliferation

Refer also to citation(s) 12327, 12461, 12463, 12464, 12466, 13002

12465 (UCRL-LR–114070-3) **Director's Series on Proliferation.** Bailey, K.C. (ed.). Lawrence Livermore National Lab., CA (United States). 5 Jan 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94005645. Source: OSTI; NTIS; GPO Dep.

This abstract series on Proliferation is an occasional publication of essays on the topics of nuclear, chemical, biological, and missile proliferation. Topics addressed in this issue are: Tactical nuclear weapons: Do they have a role in the US Military strategy?; Sanctions as a nonproliferation tool: Examining costs and benefits in the Iraqi case; Is the traditional regime enough? The US debate; the nuclear suppliers group: A major success story gone unnoticed; biological weapons: A priority concern; and problems with verifying a ban on biological weapons.

3503 Verification

Refer also to citation(s) 12980, 13020

12466 (ANL/EP/CP–81431) **Nuclear disarmament verification.** DeVolpi, A. Argonne National Lab., IL (United States). [1993]. 16p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308200–1: 3. workshop on verification of arms reduction, Geneva (Switzerland), 23-26 Aug 1993). Order Number DE94004604. Source: OSTI; NTIS; INIS; GPO Dep.

Arms control treaties, unilateral actions, and cooperative activities – reflecting the defusing of East-West tensions – are causing nuclear weapons to be disarmed and dismantled worldwide. In order to provide for future reductions and to build confidence in the permanency of this disarmament, verification procedures and technologies would play an important role. This paper outlines arms-control objectives, treaty organization, and actions that could be undertaken. For the purposes of this Workshop on Verification, nuclear disarmament has been divided into five topical subareas: Converting nuclear-weapons production complexes, Eliminating and monitoring nuclear-weapons delivery systems, Disabling and destroying nuclear warheads, Demilitarizing or non-military utilization of special nuclear materials, and Inhibiting nuclear arms in non-nuclear-weapons states. This paper concludes with an overview of potential methods for verification.

12467 (LA-UR–94-154) **Sensitive field alpha contamination monitoring for special inspections and nonproliferation verification.** MacArthur, D.W.; Allander, K.S.; Bounds, J.A.; Close, D.A.; Johnson, J.D. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (IAEA-SM–333/126; CONF-940307–17: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994). Order Number DE94006273. Source: OSTI; NTIS; GPO Dep.

Alpha-contamination monitoring in the field has traditionally been limited by the short range of alpha particles in air, the relative insensitivity of alpha monitors designed for field use, and the difficulty of operating laboratory instruments in the field. The long-range alpha detector (LRAD) described in this paper circumvents these limitations by detecting air ions produced by alpha particles rather than the particles themselves. The LRAD system comes in two configurations: one utilizes forced air to bring the ions to the detector, the other uses an electric field. We have developed successful hand-carried versions of both detectors and operated them under field conditions. The unique characteristics of LRAD systems enlarge the number of potential applications for alpha monitors in the field.

12468 (LA-UR–94-164) **Advances in passive neutron instruments for safeguards use.** Menlove, H.O.; Krick, M.S.; Langner, D.G.; Miller, M.C.; Stewart, J.E. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (IAEA-SM–333/94; CONF-940307–16: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994). Order Number DE94006271. Source: OSTI; NTIS; INIS; GPO Dep.

Passive neutron and other nondestructive assay techniques have been used extensively by the International Atomic Energy Agency to verify plutonium metal, powder, mixed oxide, pellets, rods, assemblies, scrap, and liquids. Normally, the coincidence counting rate is used to measure the ^{240}Pu-effective mass and gamma-ray spectrometry or mass spectrometry is used to verify the plutonium isotopic ratios. During the past few years, the passive neutron detectors have been installed in plants and operated in the unattended/continuous mode. These radiation data with time continuity have made it possible to use the totals counting rate to monitor the movement of nuclear material. Monte Carlo computer codes have been used to optimize the detector designs for specific applications. The inventory sample counter (INVS-III) has been designed to have a higher efficiency (43%) and a larger uniform counting volume than the original INVS. Data analyses techniques have been developed, including the "known alpha" and "known multiplication" methods that depend on the sample. For scrap and other impure or poorly characterized samples, we have developed multiplicity counting, initially implemented in the plutonium scrap multiplicity counter. For large waste containers such as 200-L drums, we have developed the add-a-source technique to give accurate corrections for the waste-matrix materials. This paper summarizes recent developments in the design and application of passive neutron assay systems.

12469 (LA-UR–94-0256) **Continuous remote unattended monitoring for safeguards data collection systems.** Klosterbuer, S.F.; Halbig, J.K.; Harker, W.C.; Menlove, H.O.; Painter, J.A.; Stewart, J.E. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (IAEA-SM–333/111; CONF-940307–15: International symposium on nuclear material safeguards, Vienna (Austria), 14-18 Mar 1994). Order Number DE94006242. Source: OSTI; NTIS; INIS; GPO Dep.

To meet increased inspection requirements, unattended and remote monitoring systems have been developed and installed in several large facilities to perform safeguards functions. These unattended monitoring systems are based on instruments originally developed for traditional safeguards and the domestic nuclear industry to nondestructively assay nuclear materials. Through specialized measurement procedures, these instruments have been adapted to be unattended monitors. This paper defines the parts of these unattended monitoring systems, describes the systems that have been installed in the field and their status, and discusses future trends for unattended systems.

12470 (SAND–93-2470C) **Random patterns and biometrics for counterfeit deterrence.** Tolk, K.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9404109–1: Secur Tech conference, Crystal City, VA (United States), 11-13 Apr 1994). Order Number DE94007263. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories (SNL) has been working on non-counterfeitable seals, tags, and documents for over fifteen years. During that time, several technologies have been developed that can be applied to deter counterfeiting of identification documents such as ID cards, passports, and possibly credit cards. Two technologies are presented in some detail. The first is reflective particle tagging technology that was developed to help verify treaties limiting the numbers of nuclear weapons that participating parties may possess. This approach uses the random locations and orientations of reflective particles applied to the surface of an item to uniquely identify the item. The resulting tags are secure against even the most determined adversaries. The second technology uses biometric information printed on the document and public key cryptography to ensure that an adversary cannot issue identification documents to unauthorized individuals.

12471 (UCRL-ID–116110) **Location capability of a sparse regional network (RSTN) using a multi-phase earthquake location algorithm (REGLOC).** Hutchings, L. Lawrence Livermore National Lab., CA (United States). Jan 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007848. Source: OSTI; NTIS; GPO Dep.

The Regional Seismic Test Network (RSTN) was deployed by the US Department of Energy (DOE) to determine whether data recorded by a regional network could be used to detect and accurately locate seismic events that might be clandestine nuclear tests. The purpose of this paper is to evaluate the location capability of the RSTN. A major part of this project was the development of the location algorithm REGLOC and application of Basian a prior statistics for determining the accuracy of the location estimates. REGLOC utilizes all identifiable phases, including backazimuth, in the location. Ninty-four events, distributed throughout the network area, detected by both the RSTN and located by local networks were used in the study. The location capability of the RSTN was evaluated by estimating the location accuracy, error ellipse accuracy, and the percentage of events that could be located, as a function of magnitude. The location accuracy was verified by comparing the RSTN results for the 94 events with published locations based on data from the local networks. The error ellipse accuracy was evaluated by determining whether the error ellipse includes

the actual location. The percentage of events located was assessed by combining detection capability with location capability to determine the percentage of events that could be located within the study area. Events were located with both an average crustal model for the entire region, and with regional velocity models along with station corrections obtained from master events. Most events with a magnitude <3.0 can only be located with arrivals from one station. Their average location errors are 453 and 414 km for the average- and regional-velocity model locations, respectively. Single station locations are very unreliable because they depend on accurate backazimuth estimates, and backazimuth proved to be a very unreliable computation.

12472 (UCRL-ID–116123) **Rockbursts as opportunities for the concealment of nuclear tests?.** Heuze, F.E. Lawrence Livermore National Lab., CA (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007849. Source: OSTI; NTIS; GPO Dep.

Based on a review of the engineering and scientific literature from 1979 to 1993 concerning mine rockbursts, it is concluded that the hiding of nuclear tests in rockbursts is a highly improbable scenario. This is due to the lack of ability for anyone to accurately predict the time and location of occurrence of natural rockbursts, in spite of active research on the subject. However, such an evasion scheme is not impossible. A contrived rockburst possibly could be made to happen in a somewhat "controlled" fashion. This rather farfetched scenario is outlined in the discussion. Such an event most likely would involve serious damage to the underground, and would be unlikely to be repeated frequently at any given site. Moreover, it would be extremely difficult to control its seismic magnitude.

36 MATERIALS

Refer also to citation(s) 12118, 12638, 12659, 12761, 13029, 13877, 13882

12473 (DOE/ER–0610T) **Materials research at selected Japanese laboratories: Based on a 1992 visit: Overview, summary of highlights, notes on laboratories and topics.** USDOE Office of Energy Research, Washington, DC (United States). Materials Sciences Div. Feb 1994. 99p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007950. Source: OSTI; NTIS; GPO Dep.

I visited Japan from June 29 to August 1, 1992. The purpose of this visit was to assess the status of materials science research at selected governmental, university and industrial laboratories and to established acquaintances with Japanese researchers. The areas of research covered by these visits included ceramics, oxide superconductors, intermetallics alloys, superhard materials and diamond films, high-temperature materials and properties, mechanical properties, fracture, creep, fatigue, defects, materials for nuclear reactor applications and irradiation effects, high pressure synthesis, self-propagating high temperature synthesis, microanalysis, magnetic properties and magnetic facilities, and surface science.

12474 (INIS-mf–13754) **Neutron capture gamma-ray technique for in situ mineral analysis.** Elkady, A.A.; Abulfaraj, W.H.; Abdulfattah, A.F. King Abdulaziz Univ., Jeddah (Saudi Arabia). Dept. of Nuclear Engineering. 1987. 79p. Project no. 07/606. Order Number DE94615443. Source: OSTI; NTIS (US Sales Only); INIS.

The application of neutron capture gamma ray method for in situ analysis of mineral deposits is discussed. A borehole sonde for prompt gamma analysis (PGA) using a 3 Ci Americium-Berelium neutron source and a hyper pure germanium detector has been designed, constructed and evaluated. The evaluation program was designed to include neutron flux distribution in the simulated borehole, both experimentally and theoretically, response of the borehole sonde to elements of different concentrations and at different locations from the sonde, response of the sonde to dry borehole and to a water layer between the sonde and the borehole casing, and the response of the sonde to various elements in the matrix. The results indicate that the sonde is able to perform in situ multielement analysis for more than 20 elements. The extent of detection depends on elemental concentration and the other associated elements in the given matrix and to the water layer thickness between the sonde and the borehole casing. 39 refs.

12475 (SAND–93-2096) **Engineered Porous Materials EXPO '93.** Sandia National Labs., Albuquerque, NM (United States). Nov 1993. 262p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9305323–: Engineered porous materials EXPO '93, Albuquerque, NM (United States), 4-6 May 1993). Order Number DE94007255. Source: OSTI; NTIS; GPO Dep.

The EXPO was organized to increase communication between US industry and DOE's national laboratories. The report contains copies of viewgraphs of all speakers and reports of workshops designed to identify priority needs of industry. A conference synopsis and set of recommendations to DOE are also included.

12476 (SAND–94-0314) **FWP executive summaries: Basic Energy Sciences/Materials Sciences Programs (SNL/NM).** Samara, G.A. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007584. Source: OSTI; NTIS; GPO Dep.

This report is divided into: budget, capital equipment requests, general programmatic overview and institutional issues, DOE center of excellence for synthesis and processing of advanced materials, industrial interactions and technology transfer, and research program summaries (new proposals, existing programs). Ceramics, semiconductors, superconductors, interfaces, CVD, tailored surfaces, adhesion, growth and epitaxy, boron-rich solids, nanoclusters, etc. are covered.

3601 Metals and Alloys

Refer also to citation(s) 11466, 11623, 11627, 11734, 11768, 12126, 12152, 12177, 12215, 12217, 12219, 12220, 12385, 12412, 12435, 12754, 12785, 12818, 13016, 13878, 13928, 14074, 14076, 14081, 14082, 14084, 14085, 14087, 14088, 14090, 14091, 14092, 14093, 14094, 14095, 14096, 14097, 14098, 14099, 14100, 14101, 14102, 14103, 14104, 14105, 14106, 14107, 14108, 14109, 14110, 14111, 14112, 14114, 14116, 14117, 14118, 14119, 14120, 14146, 14147, 14151, 14160, 14181, 14278

12477 (ANL/CHM/PP–75637) **Metal cluster-rare gas van der Waals complexes: Microscopic models of physisorption.** Menezes, W.J.C.; Knickelbein, M.B. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008134. Source: OSTI; NTIS; GPO Dep.

The first examples of metal cluster-rare gas van der Waals complexes have been produced using a molecular beam technique, providing novel microscopic models of rare gas physisorption phenomena that occur at low temperatures on extended metal surfaces. These studies show that the formation efficiency of these complexes vary dramatically with the number of metal atoms in the cluster. An interesting example is provided by iron clusters, in which the 13-atom iron cluster is relatively inert toward complexation with krypton atoms, whereas the neighboring 12- and 14-atom clusters form krypton adducts readily. Such results provide valuable insights into the surface topology (i.e., "smoothness" or "roughness") of metal clusters, which may in turn aid in developing a detailed microscopic understanding of related systems of technological interest, ranging from heterogeneous catalysts to cluster-assembled materials.

12478 (ANL/CMT/PP–75501) **Structural ordering in liquid K-Te alloys.** Fortner, J.; Saboungi, M.L.; Enderby, J.E. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008477. Source: OSTI; NTIS; GPO Dep.

Neutron diffraction from molten K_xTe_{1-x} is reported for x = 0.12 and x = 0.50 semiconducting alloys. The measured radial distribution functions (rdf) demonstrate the persistence of covalently bonded tellurium in the liquid. The rdf of the liquid $K_{0.12}Te_{0.88}$, which is dominated by the Te-Te contribution, is remarkably similar to that of pure liquid tellurium, the notable exception being that the

nearest neighbor peak is largely resolved and found to have a coordination number slightly less than 2. The $K_{0.50}Te_{0.50}$ rdf clearly indicates Te-Te pairing in the melt, and unexpected departure from the presumed similar $Cu_{0.50}Te_{0.50}$. These paired tellurium are most likely of the form $(Te_2)^{2-}$ Zintl ions.

12479 (ANL/MSD/CP–78618) **Reorientations in plastic crystal phases of Zintl alloys.** Saboungi, M.L. (Argonne National Lab., IL (United States)); Fortner, J.; Price, D.L.; Howells, W.S. Argonne National Lab., IL (United States). 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-930322–1: International workshop on dynamics of disordered materials II, Grenoble (France), 22-24 Mar 1993). Order Number DE94007697. Source: OSTI; NTIS; INIS; GPO Dep.

Quasielastic neutron scattering measurements on the Zintl alloy NaSn show that the high-temperature solid phase discovered by Hume-Rothery is a plastic crystal characterized by rapid rotations of the $Sn_4^{(4-)}$ Zintl ions. The reorientations are similar to those previously observed in CsPb but have a markedly different wave vector dependence, indicating a different behaviour of the alkali metal ions.

12480 (ANL/RE/PP–73076) **Buckling of elliptical rings under uniform external pressure.** Tang, Y. Argonne National Lab., IL (United States). 3 Apr 1991. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008486. Source: OSTI; NTIS; GPO Dep.

A thin, elastic elliptical ring is subjected to uniform external pressure. The lowest critical pressure is computed and presented for various ratio of the major axis to the minor axis of the elliptical ring. It is found that the critical pressure for an elliptical ring is higher than that for the circular ring whose diameter is equal to the major axis of the elliptical ring. It can be shown that under the same external pressure, the axial force developed in the elliptical ring is less than that developed in the corresponding circular ring. Thus, a higher pressure is required to buckle the elliptical rings. Therefore, by changing the shape of the ring from circular to elliptical, the capability of the ring to sustain the external pressure can be increased substantially. The results of this study can be useful in the design of elliptical reinforcing rings and thin-walled tubes subjected to external pressure.

12481 (BNL–60099) **Characterization of the corrosion resistance of duplex stainless steels using local current density mapping techniques.** Aldykiewicz, A.; Isaacs, H.S. Brookhaven National Lab., Upton, NY (United States). 10 Jan 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94007980. Source: OSTI; NTIS; GPO Dep.

An in situ investigation of the dissolution behavior of duplex stainless steel has been carried out in acidic solutions containing 2.0 M HCl with 2.0 M H_2SO_4 to determine differences in dissolution rates of the austenitic and ferritic phases. The current density distribution over the dissolving steel surface was measured using a vibrating electrode. The study demonstrated that this technique could quantify the differences in dissolution rates of the austenitic and ferritic phases under the conditions tested. The dissolution rates for the two phases peak at different potentials resulting in multiple current maxima. In addition, transients in dissolution behavior of the two phases at different potentials were observed using optical microscopy. Electron microscopy of the dissolved surface showed very high levels of aluminum and silicon enrichment on the austenitic phase.

12482 (CONF-931234–6) **Effect of vibratory stress relief during welding of thick stainless steel plate.** Spooner, S. (Oak Ridge National Lab., TN (United States)); David, S.A.; Wang, X.L.; Hubbard, C.R.; Holden, T.M.; Root, J.H. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Welding Society international conference on modeling and control of joining processes; Orlando, FL (United States); 8-10 Dec 1993. Order Number DE94006557. Source: OSTI; NTIS; GPO Dep.

Residual strains were measured in two welded 25-mm thick plates of type 304 stainless steel by the neutron diffraction technique. The filler metal employed to weld these plates was type 308 stainless steel. One of the two welds was prepared without any vibratory stress relief treatment and the other was vibrated at a frequency below the resonant condition which gives a fraction the resonant amplitude during welding. In both plates the largest residual stress component found in the heat affected zone and in the base metal is along the fusion joint (longitudinal) and is found at the boundary between the weld zone and the heat affected zone. This longitudinal component is 300 ± 50 MPa in tension. The associated normal stress was close to zero and the transverse stress was 80 ± 50 MPa. Variations in residual stresses with thickness through the base metal plate were small. The treated plate and untreated plate showed nearly identical patterns of stress distribution. Differences in the measured stresses between the vibratory-stress-relief treated and the untreated plates fall within the error bars of the stress determination in these particular 25 mm thick 300-type stainless steel plates.

12483 (DOE/ER/45287–1) **Metal induced embrittlement: Annual report, [March 1, 1987–February 29, 1988].** Hoagland, R.G. Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering. 1 Nov 1988. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER45287. Order Number DE94007517. Source: OSTI; NTIS; GPO Dep.

This program is investigating the causes of embrittlement that occur in certain solid metals when exposed to liquid metals. The degree of embrittlement varies enormously among different solid/liquid pairs as witness, for example, the modest loss of load carrying, ability induced in carbon steels by Pb or the profound embrittlment of aluminum (particularly high strength) alloys by Hg and Ga. The structure of this study involves two types of activities: an experimental fracture mechanics study of the behavior of certain solid metals in liquid metals, and a theoretical study on an atomic scale of the crack tip deformation and extension behavior by means of atomistic simulation. This research, which began March 1, 1987, has completed its 20 month. A brief synopsis is given of performance in each of the areas of activity during the past year.

12484 (DOE/ER/45287–2) **Metal induced embrittlement: [Annual report, March 1, 1988–February 28, 1989].** Hoagland, R.G. Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering. 31 Aug 1989. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER45287. Order Number DE94007518. Source: OSTI; NTIS; GPO Dep.

This program has been directed at the nature and cause of the severe embrittlement and loss of load carrying, capability that occurs in certain solid metals in contact with some liquid metals. This three-year program began March 1, 1987, and, during its course, has involved a set of fracture mechanics experiments to explore the response of several alloy/liquid metal systems coupled with a more theoretical study consisting of atomic simulation of the crack tip separation process. Some of the information generated in this study is contained in papers published or submitted for publication and accompanying, this report. This report is an overview of information contained in these papers as well as information currently in preparation for publication.

12485 (DOE/ER/45287–3) **Metal induced embrittlement: Annual report, [March 1, 1989–February 28, 1990].** Hoagland, R.G. Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering. 1 Oct 1990. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER45287. Order Number DE94007519. Source: OSTI; NTIS; GPO Dep.

This summarizes the progress made in this program from the start of the renewal on March 1, 1990, to date. The program is investigating the cause of embrittlement that results when certain solid metals and their alloys are exposed to other metals, usually in liquid form. The research is examining a number of factors that influence the degree of embrittlement and is also attempting to develop the basis for understanding the underlying cause of embrittlement. Accordingly, the program is a blend of theoretical and experimental approaches.

12486 (DOE/ER/45287–6) **Metal induced embrittlement: Annual report, [May 30, 1992–May 31, 1993].** Hoagland, R.G. Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering. Nov 1993. 11p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG06-87ER45287. Order Number DE94007450. Source: OSTI; NTIS; GPO Dep.

This section summarizes the progress made in this program since the its renewal on June 1, 1992 to date. This program is seeking to characterize the cause of embrittlement that results when certain solid metals and their alloys are exposed to other metals, usually, but not necessarily, in liquid form. The research is examining a number of factors that influence the degree of embrittlement and is also attempting to develop the basis for understanding, the underlying cause of embrittlement. Accordingly, the program involves both theoretical and experimental approaches.

12487 (DOE/ID/12847–6) **AISI-DOE Direct Steelmaking Program: Annual report for the year ending November 30, 1993.** Aukrust, E. American Iron and Steel Inst., Pittsburgh, PA (United States). Feb 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-89ID12847. Order Number DE94006738. Source: OSTI; NTIS; GPO Dep.

This program has completed its 5th year since cost-share funding provided by DOE. The following tasks are reported on: budget, patents, talks, and publications; design and construction of gas cleaning and tempering loop; construction of pressurized smelter and operation of combined smelter and offgas system; study for ironmaking demonstration plant and for steelmaking processes; and laboratory research programs at universities and companies.

12488 (DOE/PC/92542–T4) **Robotic weld overlay coatings for erosion control: [Quarterly report, July–September 1993].** Levin, B.F.; DuPont, J.N.; Marder, A.R. Lehigh Univ., Bethlehem, PA (United States). Energy Research Center. 20 Oct 1993. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92542. Order Number DE94008004. Source: OSTI; NTIS; GPO Dep.

In the previous period of work, twelve overlay hardfacing alloys were selected for erosion testing based upon a literature review. All twelve coatings were deposited on 1018 steel substrates using the plasma arc welding process. Ten samples from each coating were prepared for erosion testing. The coating deposition and sample preparation procedures were described in the previous quarterly report. During the past quarter, all the coatings were erosion tested at 400 C. The erosion resistance of each coating was evaluated by determining the steady state erosion rate. In addition, the microstructure of each coating was characterized before and after the erosion tests. This progress report describes the erosion test results and coating microstructures. Also, a preliminary analysis on the relationships, between weld overlay coating hardness, microstructure, and erosion resistance will be discussed.

12489 (DOE/SF/19645–T3) **High temperature materials technology research for advanced thermionic systems: Quarterly progress report for period ending September 30, 1993.** Zee, R.H.; Rose, M.F. Auburn Univ., AL (United States). [1993]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93SF19645. Order Number DE94008341. Source: OSTI; NTIS; GPO Dep.

Objective was to understand the strengthening mechanisms in advanced refractory alloys for high-temperature thermionic applications. During the first 6 months, the role of substitutional solutes in refractory alloy single crystals was identified and modeled using a simple size misfit factor as the governing parameter. During the past period, effort was concentrated on the strengthening effects in various refractory structures and the growth of refractory alloy single crystals. 11 figs, 4 tabs.

12490 (ETDE-IT–94-15) **Correlation between energy transfer and end products in mechanical alloying process.** Magini, M. (ENEA, Casaccia (Italy). Area Energia e Innovazione). No corporate text available. 1993. 22p. (CONF-9303263–1: 1. international conference on mechanochemistry, Kosice (Ceylon), 22-27 Mar 1993). Order Number DE94752516. Source: OSTI; NTIS (US Sales Only).

The energy transfer events in the Mechanical Alloying (MA) process are essentially due to attrition and to collisions between the milling tools and the milled powder. The Pd_80Si_20 composition was investigated in different milling conditions using both planetary (FRITSCH) and vibratory (SPEX) apparatuses. X-ray diffraction and differential scanning calorimetry measurements were used in monitoring the various Solid State Reactions (SSR) taking place in the different milling conditions. The paths of the SSR essentially go towards two distinct end products: a fully amorphous phase or an intermetallic compound depending on the conditions of energy transfer. The results were explained on the basis of attrition or collision events becoming predominant in given milling conditions.

12491 (ETDE-IT–94-27) **Heterogenous electron beam welding of niobium C-103 base alloy with titanium Ti-6Al-4V base alloy.** Pierantozzi, P. (ENEA, Bologna (Italy)); Franchini, F. No corporate text available. 1993. 7p. (In French). (CONF-930658–2: 5. international conference on welding and melting by electron and laser beams, La Baule (France), 4-16 Jun 1993). Order Number DE94752548. Source: OSTI; NTIS (US Sales Only).

Dissimilar metals welding of a refractory/alloy with a light alloy was carried out employing an electron beam. The great difference in physical characteristics between the materials demanded special joint process study. It was found that the welding cycle set-up bears on the problems of chemical welding-pool homogeneity. Micro-focus radiographic inspection helped to reveal very small three dimensional defects.

12492 (ETDE-IT–94-35) **Electron beam welding and post-weld treatments of 2219-T6-Al alloy.** Tosto, S. (ENEA, Casaccia (Italy)); Nenci, F. No corporate text available. 1993. 7p. (CONF-930605–1: 3. European conference on advanced materials and processes, Paris (France), 7-10 Jun 1993). Order Number DE94752604. Source: OSTI; NTIS (US Sales Only).

The paper shows the possibility to obtain defect free Electron Beam (EB) welded joints of the 2219-T6 Al base alloy of aerospace interest. Suitable post-weld EB heat treatments enable constructors to eliminate surface undercutting and improve the tensile properties of the welded joint.

12493 (INIS-BR–3268) **Surface effects induced by cathodic hydrogenation in type AISI 304 stainless steel.** Silva, T.C.V. Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia. Aug 1984. 128p. (In Portuguese). Order Number DE94617507. Source: OSTI; NTIS (US Sales Only); INIS.

Cathodic hydrogen charging of type AISI 304 stainless steel modified its austenitic structure, giving rise to the formation of two new martensitic phases and the appearance of cracks, in most cases delayed. As electrolyte a 1 N H_2 S O_4 solution containing As_2 O_3 was employed. The cathodic hydrogenation was carries out at room temperature. The transformed phases were identified with black and white and coloured metallographic techniques, as well as by X-ray diffraction. The effect of cathodic hydrogenation in samples uniaxially tensile tested with constant nominal strain rate was investigated. It was concluded that the number of cracks per unit surface area changes with hydrogenation conditions and that hydrogen should be present for the embrittlement to occur. (author).

12494 (INIS-mf–13749, pp. 58) **Photoconductivity in Ga Se under dye laser excitation.** Bidadi, H. (Tabriz Univ., (Iran, Islamic Republic of). Center for applied Physics Reseach); Kalafi, M.; Tadjalli, H.; Salmanov, V.M. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications*. Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 19.

Short communication. GALLIUM SELENIDES/photoconductivity; DYE LASERS; EXCITATION; EXCITONS; PHOTOCONDUCTIVITY

12495 (INIS-mf–13749, pp. 82) **Laser hardening of electroless nickel deposit.** Sang, M. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of). Laser Research Center); Bour-Bour, K.; Banaii, N. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 35.

Short communication. NICKEL/hardening; NICKEL/laser radiation; DEPOSITS; IRRADIATION; NICKEL; HARDENING; NICKEL PHOSPHIDES

12496 (INIS-mf–13749, pp. 83) **Laser ablation deposition. Laser-enhanced diamond growth.** Minoo, H. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Plasmas). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIAMONDS/ablation; DIAMONDS/crystal growth; DIAMONDS/laser radiation; LASER RADIATION/deposition; DIAMONDS; ABLATION; IRRADIATION; DEPOSITION; NUCLEATION; PULSED IRRADIATION

12497 (INIS-mf–13749, pp. 104) **Processing of thin films with reduced optical absorption and high laser damage thresholds.** Zarrabian, S. (Airco Coating Technology, Concord, CA (United States)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THIN FILMS/laser radiation; THIN FILMS/physical radiation effects; ABSORPTION; COATINGS; DEPOSITION

12498 (INIS-mf–13794) **Methods and assumptions for determination of neutron fluence onto the WWER pressure vessel.** Ilieva, K.; Apostolov, T. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 5p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94615484. Source: OSTI; NTIS (US Sales Only); INIS.

The determination of neutron fluence onto the WWER pressure vessel is considered as an essential part of the Pressure Vessel Surveillance Program. The main tools for determining the pressure vessel fluence are the neutron transport calculations. From metrological point of view the development of methods for determination of the pressure vessel fluence during the reactor operation should involve the following aspects of the problem: (1) Reasonable choice of the numerical method for neutron flux calculation. A discrete ordinate SN method has been nowadays successfully applied in one- and two-dimensional geometry. The synthesis of them in three-dimensional geometry is applied for neutron fluence assessment. The adequate determination of neutron flux depends on the choice of P_N, SN-approximations, multigroup libraries of neutron constants, steps of variables discretization, choice of neutron source, based on the flux distribution averaged over the power distribution; (2) a mechanism to prove the calculation validity based on comparisons with appropriate benchmark-experiments, measurements of the reaction rates behind the reactor pressure vessel, mock up experiments, etc.; (3) Choice of detectors, materials purity, place for carrying out measurements; (4) Assessment of errors, due to the inaccuracies, connected both with the numerical calculations and the measurements, coming from geometrical dimensions, temperature fluctuation, uncertainty in the chemical composition, cross sections etc; (5) For revision of data and reevaluation under new knowledge it is necessary to compile and store data for the fluence from activation threshold detectors, placed behind the pressure vessel, onto the vessel and at 1/4T inside the vessel at the maximum radiation effect level. The reliability of conclusions concerning the radiation embrittlement of pressure vessel metal and the limits of its operation directly depends on the authenticity of the neutron fluence results. (author).

12499 (INIS-mf–13795) **Data compatibility for various Charpy-tests.** Petrova, T. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 6p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94617534. Source: OSTI; NTIS (US Sales Only); INIS.

An approach is proposed for determination of mechanical properties alteration of the irradiated metals. It consists in comparing the metal condition before and after the irradiation. The base material is tested in so called 'cold' cells, while the irradiated samples - in 'hot' ones. As long as the tests could be carried out in different laboratories, having at their disposal different Charpy test machines (with different parameters), from metrological point of view it is necessary to perform benchmark investigations in order to verify the compatibility of data obtained. They should include: comparison of the results, obtained in different 'cold' cells or in different 'hot' cells; comparison of the results, obtained in 'cold' and 'hot' cells; comparison of the results, obtained with or without electron filtration after the amplifier; comparison of the on-line and off-line results. Such benchmark investigations would enable the utilization of the results accumulated in data bank from all available experiments for a further complete assessment and for analysis of the metal state of the reactor pressure vessel. (author).

12500 (INIS-mf–14132) **Effects of phosphorus and other impurities in materials from steam turbines on the mechanical and corrosion properties. Pt. 1 and 2: COST 505 - final report.** Kuepper-Feser, J.; Grabke, H.J.; Gaertner, E. Max-Planck-Institut fuer Eisenforschung GmbH, Duesseldorf (Germany). 1990. 17p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03K0502. Order Number DE94752428. Source: OSTI; NTIS (US Sales Only); INIS.

The final report is divided in two parts: The aim of the first study was to investigate the kinetics of the grain boundary segregation of phosphorus in three Ni-20%Cr-alloys applying Auger electron spectroscopy. In connection with the grain boundary analysis the strength of these alloys was to be determined from tensile tests. Furthermore, with the same alloys constant strain rate tests were performed under cathodic charging with hydrogen in H_2SO_4, to determine the effect of phosphorus at grain boundaries on the hydrogen-induced stress corrosion cracking. The aim of the second study was to investigate the effect of phosphorus additions on the creep behaviour of Ni, Ni-20%Cr and Nimonic 80A. It was concluded that additions of up to 200 ppm P may be useful for improving the creep behaviour of such materials. (MM)

12501 (INIS-mf–14136) **Neutron and X-ray scattering to study defects, phase transitions and interfaces.** Peisl, J. Muenchen Univ. (Germany). Sektion Physik. 1989. 27p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03PE1LMU. Order Number DE94752432. Source: OSTI; NTIS (US Sales Only); INIS.

This report covers the short version of three projects: TP 1 " Defect correlations after neutron irradiation" - Measurements of diffuse X-ray scattering at metals after low-temperature irradiation with reactor neutrons have yielded quantitative information on correlations both of interstitial atoms and vacancies in the defect cascade. TP 2 "Hydrogen in metals" - By means of neutron and X-ray scattering methods, in particular the macroscopic hydrogen density modes at NbH_x and NbO_yD_x were detected. By means of the orientation glass $(KBr)_{1-x}(KCN)_x$ the structure and dynamics of elastic CN^- dipoles were explored. Other subjects studied were: 1. Quasi-elastic line spread of coherent and incoherent neutron scattering of D in Nb. 2. Diffuse scattering at NbO_x and NbO_xD_y between room temperature and 10 K. 3. Influence of O on the phase diagram of D in Nb. 4. Temperature dependence of the static Debye-Waller

factor in the system TaN_x. TP 3 "Total reflexion scattering" - Total reflexion scattering has systematically been developed into a surface-sensitive measuring technique which has made it possible to obtain quantitative depth profiles of scattering intensities. That was possible by exact external control of glancing angles of incidence and deflection (α_i and α_f), and by using position sensitive detectors. Doing that, depth profiles of scattering of between 20 Aand several 100 Awere produced. (orig.)

12502 (INIS-mf–14179) **Model test of reactor vessel wall. Pt. 2: Test performance, measurement and partial evaluation.** Maile, K.; Eckert, W.; Theofel, H.; Purper, H. Stuttgart Univ. (Germany). Staatliche Materialpruefungsanstalt. Jul 1992. 20p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT RB 7061; Project Number MPA 8707 00 000. Order Number DE94752435. Source: OSTI; NTIS (US Sales Only); INIS.

Due to test interruption because of cut promotion means, the original objective of the project - verification of reactor wall design - could not be achieved because by that point in time the slabs had not yet failed (DIN 1.4948 = X 6 CrNi 18 11). Considering, however, the elongation curve, in particular that of the faulty slab, failure at an earlier stress cycle value than calculated is highly probable. (orig./HP)

12503 (INIS-RU–349) **Problems of nuclear science and technology: Scientific-technical collection.** Materialovedenie i novye materialy, no.1/45. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 86p. (In Russian). Order Number DE94615464. Source: OSTI; NTIS (US Sales Only); INIS.

Corrosion-resistant steels and alloys were studied for behaviour of their mechanical and physical properties under reactor irradiation. Structural materials for nuclear power plants were considered. A discussion on the ways of suppression of radiation swelling in austenitic steels is presented.

12504 (INIS-RU–351) **Problems of nuclear science and technology: Scientific-technical collection.** Yadernaya tekhnika i tekhnologiya, no.5. Trudy seminara "25 let ehkspluatatsii reaktora IVV-2M". Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

The properetes of zirconium, zirconium-niobium alloys and beryllium under conditions of logn-term irradiation were investigated. Microstructure, corrosion resistance, radiation growth and swelling of the materials studied were under consideration.

12505 (INIS-RU–351, pp. 3-12) **Investigations into the state of zirconium tubes of reactor channels after long-term operation in Kursk-1 reactor.** Shemyakin, G.V.; Sinel'nikov, L.P.; Kozlov, A.V.; Matveev, A.V.; Shemyakin, V.N.; Tsygvintsev, V.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

The data are presented on short-term mechanical properties, fatigue cracking, corrosion behaviour and fine structure of zirconium alloy tubes operating as reactor channels in LWGR type reactor. Specimens for testing and examination were cut out of tube parts appropriate to maximum and minimum neutron fluences. Mechanical tests revealed noticeable radiation hardening of Zr-2.5Nb alloy. After 13.5 year operation the ultimate strength increase was found to reach 44% with specific elongation decrease from 19 down to 3.2%. Electron microscopical and X-ray diffraction studies showed that radiation damage accumulation in the form of dislocation loops and clusters was the cause of changes in mechanical properties. With consideration for data on gaseous corrosion, hydridation and strength properties it is concluded that reactor channels retain the operational ability and provide a high degree of safety for further NPP running. 3 refs.; 5 figs.; 6 tabs.

12506 (INIS-RU–351, pp. 13-24) **Study of protective properties of oxide films and tendency to local corrosion in zirconium-niobium alloys.** Matveev, A.V.; Perekhozhev, V.I.; Sinel'nikov, L.P.; Shemyakin, G.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

With the aim of verification of applicability of local corrosion electrochemical model to zirconium-niobium alloys an investigation was made into protective properties of oxide films produced on Zr-1%Nb an Zr-2.5%Nb alloys under thermal oxidation conditions. Protective properties were estimated by methods of AC impedance and electrochemical decoration with copper. Poor corrosion protection with thin films was revealed to be caused by cathodic areas with high local electronic conductivity. Protective properties increased with oxide film thickness. The proposals were made on the nature of cathodic areas in the films. 13 refs.; 4 figs.; 1 tab.

12507 (INIS-RU–351, pp. 25-37) **Irradiation growth of zirconium alloys.** Kalachikov, V.E.; Golovachev, M.G.; Rodchenkov, B.S.; Abramov, V.A.; Kalinin, G.M. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

Irradiation growth of zirconium alloys type E-125 (Zr-2.5%Nb) and E-635 (Zr-1.5%Nb-1%Sn) variously heat treated was studied depending on parameters of reactor irradiation. It was found that dimensional variations increase with neutron fluence and neutron flux density, their sign being determined by material texture coefficient. Within the temperature range of 80 to 350 deg C radiation-induced deformation increases with temperature drop and decreases with temperature rise. The most tendency to irradiation growth under conditions studied displays alloy type 3-125. 1 refs.; 8 figs.; 1 tab.

12508 (INIS-RU–351, pp. 38-47) **To the character of dose dependence of ultimate strength in beryllium under cryogenic irradiation.** Sernyaev, G.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

Based on earlier investigation results an assumption is made of dependence of beryllium ultimate strength on neutron fluence under irradiation at temperature of 80 K. At the stage of material softening correlation between swelling and ultimate strength change is established. The possibility of the attainment of beryllium complete softening ('sigma'<i<u<r<=o) is discussed. The swelling value of 0.78% is revealed to correspond to this state at critical fluence of 1.7×10^{21} neutr.·cm^{-2}. A conclusion is made that the material strengthening at the first stage is due to dislocation pinning with radiation defects while material softening at the second stage of irradiation is conditioned by the stresses of swelling anisotropy. 4 refs.; 5 figs.; 1 tab.

12509 (INIS-RU–351, pp. 48-56) **Beryllium softening and embrittlement under low-temperature irradiation.** Sernyaev, G.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

The dependences of beryllium tensile properties (ultimate strength and specific elongation) on neutron fluence under irradiation at 60 deg C are presented and analyzed. Critical values of fluence and swelling that induce complete softening of the material (σ_u=o) are determined. Variation of ultimate strength with neutron fluence proceeds in two stages. At the first stage beryllium is hardened due to dislocation pinning. At the second stage material softening takes place which results from stresses induced by radiation swelling anisotropy. 7 refs.; 3 figs.

12510 (INIS-RU–351, pp. 57-61) **On zirconium conversion in superhigh-purity water production.** Golovachev, M.G.; Bedin, V.V.; Vizzhachij, A.G. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1992. 62p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical*

collection. Order Number DE94617566. Source: OSTI; NTIS (US Sales Only); INIS.

Preliminary tests on zirconium alloys compatibility with suporhigh-purity watr have been conducted. Commercial zirconium and Zr-1%Nb alloy are considered as substitute materials in high-purity water production to replace polyvinyl chloride and fluoroplastic which are currently used for the purpose. The data are presented on changes in electric conductivity of the water be exposed to the alloys mentioned. 3 refs.; 4 tabs.

12511 (INIS-RU–370, pp. 37-40) **Radiation-induced swelling and the principles of alloying.** Parshin, A.M.; Zvyagin, V.B.; Kolosov, I.E.; Krivoruk, M.I.; Teplukhin, V.G. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

Different ways to create materials with high resistance to swelling and to decrease swelling of austenitic alloys are considered. The determination effect of homogeneous solution decomposition on the additional compulsory recombination of polar radiation defects in the fields stresses formed during the latent period of intermetallic phases formation is confirmed. The principles of alloying to provide compulsory recombination are determined. 11 refs.; 4 figs.

12512 (INIS-RU–370, pp. 56-59) **Experimental study of electroinsulating coatings on steels as applied to blanket cooling with lead or lead-bismuth.** Beznosov, A.V.; Karatushina, I.V.; Murav'ev, E.V.; Filyakin, M.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

An experimental study has been carried out with electroinsulating coatings on steels formed and finished in lead and lead-bismuth coolant at temperatures up to 600 deg C. Films with the contact resistance of 10^{-5} Ohm x m^2 and higher have been obtained and maintained. That confirms good prospects for further development of the tubular blanket design with lead or lead-bismuth cooling. 4 refs.; 2 figs.; 2 tabs.

12513 (INIS-RU–370, pp. 78-79) **Quantitative estimation of sodium penetration depth in stainless steels.** Gerasimov, V.V.; Orlov, V.V.; Strebkov, Yu.S. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The relations for quantitative estimation of sodium penetration depth in stainless steels as a function of temperature, time and oxygen content in sodium are proposed. The calculated and experimental values do not significantly differ. 5 refs.; 1 tab.

12514 (INIS-RU–371) **Problems of nuclear science and technology: Scientific-technical collection.** Yadernaya tekhnika i tekhnologiya, no.5. Svarka v yadernoj tekhnologii. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

A collection of papers deals with welding problems in reactor technology. The quality of welded joints and heat affected zones is under consideration for the cases of manufacturing reactor fuel assemblies, heat exchangers and multilayer cylindrical shells. A number of technological procedures is suggested aimed to prevent defect formation during explosion laser and electron beam welding of steels and titanium alloys.

12515 (INIS-RU–371, pp. 4-6) **Congress of the International Welding Institute.** Khavanov, V.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Materials of the 43-rd International Welding Institute Congress related to deepened studies on welding processes by electrodes in protective gases, creations of automated control systems for arc welding, development of complex highly automated welding equipment and area expansion of field of practical applications of arc welding robots are considered.

12516 (INIS-RU–371, pp. 7-11) **Influence of porosity on impact strength of chromium steel welded joints.** Chamov, S.V.; Kazennov, Yu.I.; Minaev, A.V.; Domnin, S.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Tests on impact bends of welded joints in porous welded seams are carried out relative to manufacture of fuel elements with pores in jacket rubes, made of 13% chromium steel. Comparison is made of test results for porous and noporous samples, as well as for samples of parent metal. It is established that presence of pores in the joint with volume content of 0.3% results in decrease of impact strength by 15-20%, which makes it possible to relate the pores to low-significant defects in as-welded and tempered states. 5 figs., 2 tabs.

12517 (INIS-RU–371, pp. 12-15) **Gas environment effect on main parameters of metal drop transition during consumable electrode welding with short-circuit current.** Ishchenko, Yu.S. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Dependencies of droplets transition into the bath on welding current pulse amplitude, beginning of its effect and time of its action under different gaseous atmosphere of arc gap are obtained on the basis of calculated data. Current critical values, excluding the droplets sition into batl at the moment of establishing the droplet-bath contact as well as by the transition itself are determined and compared with the data obtained by other authors. Velocity values for the droplet entry into the bath depending on the current and time of its action are presented. 4 refs., 4 figs., 2 tabs.

12518 (INIS-RU–371, pp. 16-20) **Development of the model for consumable electrode arc welding in the vicinity of optimum point and control parameter selection.** Bukarov, V.A.; Aleksandrov, V.M.; Dorina, T.A.; Ivin, E.V.; Kartashev, D.V.; Sanina, S.B. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Interrelation parameters of such modes as power supply source lovse passage voltage, welding current, electrode gap, inclination angle of power source static volt-ampere characteristic from quality indicator of consumable electrode welding, expressed by frequency variation coefficient of arc gap shortings are determined by experimental-statistic method. Analysis of the mode optimum point in parameter coordinates provides for selection of the most efficient among them with the purpose of the proress regulation. 2 refs.; 4 figs.

12519 (INIS-RU–371, pp. 21-23) **System for power density stabilization on argon tnngsten-arc welding.** Vinogradov, V.A.; Shchavelev, L.N. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

System for power density stabilization at the point of arc-welding bath interrelation is proposed. Intensity of welded metal vapour luminiscence is used as information on power density changes. Experimental stabilization system is created, the tests results of which indicated the possibility of its application for compensation of uncontrolled perturbations during welding related to changes of

electrode characteristics, change of sharpening angle, emission loos. 7 refs.; 4 figs.

12520 (INIS-RU–371, pp. 24-29) **Influence of crack-type notches on impact strength of chromium and austenitic steel welds.** Romanenkov, E.I.; Chamov, S.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Samples with sharp notches for testing impact strength are developed and tested; methodologies for obtaining hot cracks at the notch basis and with sharp notch in melting zone are proposed. It is shon that: sharp wnotch in tests on impact strength is similar to hot cracked; essential increase in the threshold of cold brittleness in samples with sharp notch as compared to standard samples; essential decrease, especially at low temperatures, in energy to failure for samples with sharp notch as compared to standard samples; determination of welded joints fracture properties, especially at low temperatures, is advisable additionally on samples with sharp notches. 6 figs., 2 tabs.

12521 (INIS-RU–371, pp. 30-34) **On some technological procedures for decreasing possibility of hot crack initiation on welding of thinwalled items.** Zhitkov, S.V.; Romanenkov, E.I. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Process parameters cansing formation of hot cracks in joints and in heat affected zone, on welding chromium and austenitic steels are identified. A number of technological appoaches for preventing crack formation by crater welding-up and under stationary mode are proposed; device for current reduction on crater welding-up is developed. 6 refs., 4 figs.

12522 (INIS-RU–371, pp. 34-38) **Electron beam welding of heaters for domestic convectors.** Vinogradov, V.A.; Bratchuk, S.D.; Ser'eznov, V.A.; Kuznetsov, A.I.; Trifonov, V.A.; Prosvirin, V.P. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Results on developing technologies and equipment for electron-beam welding are presented. Studies on parameter selection for electron-beam welding technological process, providing for maximum efficiency and possibility of welding without surface preparation and treatment are carried out. Scheme for welding plates to tubes simultaneously by two guns with horizontal axes, positioned at different sides of the sources, passing through tube axes, is selected. The welding is carried by splittered electron beam with continuously moving heat exchanger. 5 refs.

12523 (INIS-RU–371, pp. 38-40) **Some features of manufacturing welded silphons of titanium alloys.** Popenko, V.S.; Shchavelev, L.N.; Popenko, A.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Peculiarities of manufacturing welded silphons of titaniuu alloys are considered. Technology for welding silphons, providing for high and stable quality of welded joints with applications of assembling-welding equipment and individual systems for protection gas purification against harmful admixtures is mastered. 3 refs., 2 figs.

12524 (INIS-RU–371, pp. 44-48) **Peculiar features of manufacturing multi-layer cylindrical shells by explosion welding.** Didyk, R.P.; Gul'bin, V.N.; V'yunnik, A.N.; Ruchkin, V.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Possibility of manufacturing multi-layer cylindrical shells (ten and more layers) of metal bands is studied. Determining influence of welding schemes on the process of formation and stability of cylindrical shells subjected to deformation by explosion is shown. Analysis of possible schemes for manufacturing multi-layer shells revealed some peculiarities of deformation character and showed that structural changes are observed during realization of various welding schemes at the interface boundary. Mechanical test results make it possible to optimize parameters for the mode of multi-layer shell explosion welding. 7 refs., 4 figs., 1 tab.

12525 (INIS-RU–371, pp. 49-51) **Cumulative effect during explosion welding of tubular billets.** Gul'bin, V.N.; Busalaev, I.D.; Rakitin, V.N.; Shmorgun, V.G. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation). 1991. 52p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617508. Source: OSTI; NTIS (US Sales Only); INIS.

Cumulative effect origination on heterogeneous tube explosion welding is studied. Analysis of study results made it possible to determine measures against formation of undesirable cumulative jet between tubular walls during explosion welding. Interrelation between loss of energy on the cumulative jet and the crater depth, formed under influence of this jet is established. 3 refs., 2 figs.

12526 (ITP–92-54E) **Pairing and low temperature properties of 2 D Fermi-systems with attraction between particles.** Gorbar, E.V.; Gusynin, V.P.; Loktev, V.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 41p. Order Number DE94615510. Source: OSTI; NTIS (US Sales Only); INIS.

Proceeding from microscopic model Hamiltonian for the system of Fermi-particles with attraction the effective Lagrangian, admitting the analysis of its superconducting properties at arbitrary fermion concentration, is obtained.Exact solution for gap and chemical potential makes it possible to trace from local pair situation to Cooper pairing. The crucial parameter discriminating between the regions of exotic and normal superconducting behaviour is show to be that of the energy of the bound fermion state, which, however, rapidly disappears with fermion density increasing. The solutions of the equations for the case of finite temperatures are analysed. (author). 42 refs.

12527 (ITP–93-12E) **Twin spacing versus size of a monocrystal for the nonstoichiometric 1:2:3 superconductors.** Nikolaev, V.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. Order Number DE94615511. Source: OSTI; NTIS (US Sales Only); INIS.

A physical model which can describe the twins' formation in a high-temperature region of a structural phase diagram is suggested. The dependence of the twin spacing vs size of a monocrystal differs from the classical square root law as a result of a nonstoichiometry of the compound according to the model. (author). 12 refs.

12528 (Juel–2769) **Electron microscope, metallurgical and mechanical investigations of the decagonal phase in the Al-Co-Cu(-S1) system.** Wittmann, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Festkoerperforschung; Technische Hochschule Aachen (Germany). May 1993. 155p. (In German). Order Number DE94747629. Source: OSTI; NTIS (US Sales Only).

The decagonal phase is a special form of quasi-crystals, which contain a tenfold axis. The aim of this work was to obtain a more exact knowledge of the real sructure of the decagonal phase, including its defect structure. Also, the metallurgical conditions of production were to be cleared up, with the aim of improving the methods of growing quasi-crystals. Special attention was paid to the relationships between stochiometry, temperature treatment and structure of the decagonal phase. Finally, investigations were made of the properties, particularly their possible anisotrophy. (orig./MM)

12529 (LA-UR–93-4520) **Attempts to model the generation of new grain boundaries during the deformation of polycrystals.** Kocks, U.F. (Los Alamos National Lab., NM (United States)); Cotton, J.D.; Chen, S.R.; Wright, S.I.; Rollett, A.D.; Embury, J.D.; Beaudoin, A.J. Los Alamos National Lab., NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931009–21: Fall meeting of the Minerals, Metals and Materials Society: physical

metallurgy and materials, Pittsburgh, PA (United States), 17-21 Oct 1993). Order Number DE94007527. Source: OSTI; NTIS; GPO Dep.

We explore ways by which new orientations ("nuclei") can arise during essentially homogeneous deformation in polycrystals. All of these can be categorized as generating new large-angle boundaries: one is due to excessive storage of dislocations of one sign parallel to existing grain boundaries; another is due to reactions of cell walls with grain edges; and in the last, new boundaries are created surrounding a domain of different slip system distribution.

12530 (LBL–34991) **Aging effects on the microstructure, surface characteristics and wettability of Cu pretinned with Sn-Pb solders.** Linch, H.S. Lawrence Berkeley Lab., CA (United States). Nov 1993. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007033. Source: OSTI; NTIS; GPO Dep.

This study investigates effects of aging in air and argon at 170 C on Cu coupons which were pretinned with 75Sn-25Pb, 8Sn-92Pb, and 5Sn-95Pb solders. Coatings were applied using electroplating or hot dipping techniques. The coating thickness was controlled between 3 to 3μm and the specimens were aged for 0 hours, 2 hours, 24 hours and 2 weeks. Wetting balance tests were used to evaluate the wettability of the test specimens. Microstructural development was evaluated using X-ray diffraction, energy dispersive X-ray and Auger spectroscopy, as well as optical and scanning electron microscopy. The wetting behavior of the test specimens is interpreted with respect to observed microstructural changes and as a function of aging time, solder composition, and processing conditions.

12531 (LBL–35057) **Work hardening behavior in aluminum alloy 2090.** Tseng, C. (Lawrence Berkeley Lab., CA (United States)). Lawrence Berkeley Lab., CA (United States). Dec 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007036. Source: OSTI; NTIS; GPO Dep.

An investigation into the work hardening behavior of an aluminum alloy 2090-T81 Al-3.05Cu-2.16Li-0.12Zr at various test temperatures, heat treatment conditions and microstructures was conducted. One microstructure consisted of unrecrystallized, highly textured grains, and the other microstructure was composed of recrystallized grains. Microstructural effects on work hardening were divided into two levels of contribution: the grain structure level, which consisted of the grain size and shape, subgrains and texture, and the microconsistent level, which included the precipitates and solutes. Two heat treatments were studied: the as-received, peak-aged condition, and the solution heat treated condition where the as-received plate was resolutionized. Observations of the deformed surface of both as-received grain structures at various prestrains indicated that there was no correlation between an increase in slip homogeneity and an increase in work hardening. The increase in out-of-plane grain rotation at lower temperatures was not primarily responsible for the increase in work hardening. In addition, the fully plastic deformation microstructure for the unrecrystallized microstructure appeared very inhomogeneous as the grains deformed in bands; there were also bands of grains that had very little to no deformation. From the work hardening plots it was found that an unrecrystallized, (110)<112> textured grain structure with a homogeneous distribution of subgrains produced the highest rate of work hardening between 300 K and 77 K. When the microconstituents are added to both grain structures, both the work hardening rate in the elastic-plastic and fully plastic regimes and the level of work hardening at which the elastic-plastic to fully plastic transition occurred were affected.

12532 (NUREG/CR–6139) **Crack-arrest tests on two irradiated high-copper welds: Phase 2: Results of duplex-type experiments.** Iskander, S.K. (Oak Ridge National Lab., TN (United States)); Corwin, W.R.; Nanstad, R.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Mar 1994. 175p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12513). Source: OSTI; NTIS; INIS; GPO.

The objective of the Heavy-Section Steel Irradiation Program Sixth Irradiation Series is to determine the effect of neutron irradiation on the shift and shape of the lower-bound curve to crack-arrest toughness data. Two submerged-arc welds with copper contents of 0.23 and 0.31 wt % were commercially fabricated in 220-mm-thick plate. Crack-arrest specimens fabricated from these welds were irradiated at a nominal temperature of 288°C to an average fluence of 1.9×10^{19} neutrons/cm^2 (>1 MeV). This is the second report giving the results of the tests on irradiated duplex-type crack-arrest specimens. A previous report gave results of tests on irradiated weld-embrittled-type specimens. Charpy V-notch (CVN) specimens irradiated in the same capsules as the crack-arrest specimens were also tested, and a 41-J transition temperature shift was determined from these specimens. "Mean' curves of the same form as the American Society of Mechanical Engineers (ASME) K_{Ia} curve were fit to the data with only the "reference temperature" as a parameter. The shift between the mean curves agrees well with the 41-J transition temperature shift obtained from the CVN specimen tests. Moreover, the four data points resulting from tests on the duplex crack-arrest specimens of the present study did not make a significant change to mean curve fits to either the previously obtained data or all the data combined.

12533 (ORNL/M–3198) **Creep-fatigue criteria and inelastic behavior of modified 9Cr-1Mo steel at elevated temperatures: Final report.** Ruggles, M.B. (Oak Ridge National Lab., TN (United States)); Ogata, T. Oak Ridge National Lab., TN (United States); Electric Power Research Inst., Palo Alto, CA (United States); Central Research Inst. of Electric Power Industry, Komae, Tokyo (Japan). Komae Research Lab. Feb 1994. 60p. Sponsored by Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. Order Number DE94007915. Source: OSTI; NTIS; GPO Dep.

The ever increasing demand for safety requires that stringent and conservative methodology be developed for design and analysis of reactor components. At present modified 9Cr-1Mo steel is a candidate material for construction of steam generators in fast breeder reactors. Therefore high-temperature material properties and extensive insight into deformation behavior and creep-fatigue life are required to develop design guidelines for use of modified 9Cr-1Mo steel in actual plant components. However, existing information on creep-fatigue and deformation response of modified 9Cr-1Mo steel is insufficient, and further experimental and modeling efforts are needed. A joint effort between the Electric Power Research Institute (EPRI) in the United States and the Central Research Institute of Electric Power Industry (CRIEPI) in Japan was started in 1991 to investigate the inelastic behavior of and to develop creep-fatigue criteria for modified 9Cr-1Mo steel at elevated temperatures. The current program focuses on uniaxial and biaxial fatigue, creep, and creep-fatigue tests. Results of this effort are presented in this report. Section 2 introduces the test material and experimental arrangement. Uniaxial exploratory deformation tests and unified constitutive equations for inelastic analysis of modified 9Cr-1Mo steel are presented in Sections 3 and 4, respectively. Axial fatigue and creep-fatigue test results are discussed in Section 5. Section 6 is devoted to constant stress creep tests. Biaxial fatigue and creep-fatigue tests are described in Section 7. Progress in creep-fatigue life evaluation is reported in Section 8.

12534 (PNL-SA–23410) **Stage 1 behavior in a stress corrosion study of Type 304 stainless steel.** Lund, A.L. (Washington State Univ., Richland, WA (United States)); Jones, R.H. Pacific Northwest Lab., Richland, WA (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940222–13: Corrosion 94: National Association of Corrosion Engineers (NACE) international annual conference, Baltimore, MD (United States), 28 Feb - 4 mar 1994). Order Number DE94008054. Source: OSTI; NTIS; GPO Dep.

In stress corrosion studies, crack velocity plotted with respect to stress intensity generally yields a characteristic curve with three distinct regions. Stage I exhibits a threshold (K_{ISCC}) followed by a rapid increase in crack velocity (da/dt) for small changes in stress intensity. Stage II is characterized by an essentially constant crack velocity with increases in the stress intensity. Stage III exhibits a

rapid increase in crack velocity for small increases in stress intensity leading to fracture. Stage I behavior has been poorly characterized in literature due to previous emphasis on determining the threshold K_{ISCC} and difficulty and uncertainty in measuring of a large increase in crack velocity with only incremental changes in stress intensity. Tests were conducted in the stage I regime to measure crack velocity as a function of constant stress intensity. Constant K specimens were prepared according to the Mostovoy design, (a tapered double cantilever beam). Specimens were prepared from Type 304 stainless steel containing 0.06 wt% C solution annealed at 1100C for 1 hour, water quenched, and annealed at 625C for 24 hours to produce sensitization. A sodium thiosulfate solution at 50°C was chosen as the test environment.

12535 (SAND–93-2047C) **Gettering of metal impurities by cavities in silicon.** Myers, S.M.; Follstaedt, D.M.; Bishop, D.M.; Medernach, J.W. Sandia National Labs., Albuquerque, NM (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940537–1: 7. international conference on silicon materials science and technology, San Francisco, CA (United States), 22-27 May 1994). Order Number DE94005248. Source: OSTI; NTIS; GPO Dep.

Ion implantation of He into Si followed by annealing $\gtrsim$700C produces nanometer-scale cavities from which the He has diffused. Experiments utilizing Rutherford backscattering spectrometry and transmission electron microscopy show that these cavities trap Cu impurities with a binding energy of 2.2±0.2 eV relative to solution, whereas the binding energy in precipitates of the equilibrium silicide phase Cu_3Si is determined to be 1.7 eV. Preliminary results indicate that Ni impurities also are bound more strongly at internal surfaces than in silicide precipitates. These findings suggest that cavity traps may provide exceptionally effective gettering of transition-metal impurities. Additional properties relevant to gettering are discussed, including fundamental differences between trapping and precipitation dynamics, the replacement of Cu by H atoms at internal surface sites cavity-associated electronic levels in the band gap, and microstructural stability of the cavities.

12536 (SAND–93-2679C) **Experimental measurement of dynamic failure and fragmentation properties of metals.** Grady, D.E.; Kipp, M.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940256–1: National Science Foundation (NSF) symposium on dynamic failure mechanics of modern materials, Pasadena, CA (United States), 3-5 Feb 1994). Order Number DE94007377. Source: OSTI; NTIS; GPO Dep.

An experimental method for determining failure and fragmentation properties of metals in catastrophic breakup events has been pursued in this work. Spherical samples of the test metals were launched at high velocities with a two-stage light-gas gun facility and subjected to controlled impulsive loading by impact on a stationary non-metallic plate. Fragmentation and motion of the debris were diagnosed with multiple flash radiography. Methods for determining critical failure properties and the fragmentation toughness of the test metals were explored.

12537 (SAND–94-0283C) **High temperature ductility loss in titanium alloys – A review.** Rath, B.B. (Naval Research Lab., Washington, DC (United States). Materials Science and Component Technology Directorate); Imam, M.A.; Damkroger, B.K.; Edwards, G.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940221–3: 1994 TMS annual meeting on actinides, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94006606. Source: OSTI; NTIS; GPO Dep.

It is well known that two phase titanium alloy systems suffer from an abrupt drop in ductility at elevated temperatures in the range of 1,000 to 1,150 K. This loss of ductility is manifested by easy decohesion of polycrystalline aggregates along the grain boundaries of the high temperature beta phase. If the alloy is in a state of tensile stress at the aforementioned temperatures, cracks initiate at the grain boundaries and propagate readily through the alloy, leading to premature failure. This phenomenon is a cause of major concern in titanium alloy fabrication and welding. Several mechanisms have been proposed to explain high temperature crack nucleation and growth along the boundaries. A critical review of the phenomenon and possible mechanisms responsible for the observed behavior will be discussed.

12538 (SR/H–671) **Stress corrision of stainless steel equipment: Use of chlorine bearing materials.** Nemeth, S.R. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 16 Jul 1963. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94006181. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A program now nearing completion was initiated late last year to determine the chlorine content of maintenance materials used at the Savannah River Plant. It is recommended that tentative limits be adopted for maximum tolerable chlorine content of any maintenance material used with type 304 stainless steel in specific type of services. To stay within these limits p use of high-chlorine bearing materials should be discontinued where possible. In the remaining cases,, the program should be extended to include the finding of suitable substitute materials having low chlorine content.

12539 (SR/H–672) **Type 308-L filler metal corrosion release.** Harpring, J.R. Hanford Engineer Works, Richland, WA (United States). 11 Jul 1963. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94006785. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This memorandum provides recommendations to control 308-L weld filler metal at the Savannah River Plant.

12540 (SR/H–676) **Corrosion evaluated type 304L and 308L stainless steel for use at SRP.** Singleton, F.D. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 5 Aug 1964. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94007136. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Since Engineering Specification SW-820M "Wrought Austenitic Stainless Steel AISI 300L Series, Low Carbon Grades" was revised in 1963 to eliminate the Huey test for corrosion evaluation, SRP has been discussing a proper way to specify and administer the control of materials that go into equipment for the Savannah River Works. There has never been any question of an adequate specification for the material. Rather, it lies in the complete specification of the job, including the fabrication specification SG2S which still calls for use of spec. SW 820M. SRP has now been asked to approve a new Material Specification No. 4498, which is proposed to be used in the purchase order and on the "Notes" drawing. The writer proposed as an alternate that (1) SRP prepare a material specification and a fabrication specification under SRP numbers, and (2) that all purchase orders and drawings covering equipment for use in the 200 Area at SRP, and which requires corrosion evaluated material, whether purchased by SRP or the Engineering Department, use only the SRP specification numbers.

12541 (SR/H–677) **Savannah River Plant – 100 and 200 Areas: Specification No. 4498 – Corrosion evaluated type 304L and 308L stainless steel for SRP.** Vroman, G.M. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 21 Oct 1964. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94007137. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This letter will confirm the discussion of October 21, 1964, of the application of the above specification to stainless steel for the 100 Areas. SRP suggests that the 100 Area problems which have been attributed to stress corrosion cracking produced by chloride concentrations should be considered in the revision of the specification. Presumably this can be accomplished by an addition to Section 7 which would define the acceptable practices with respect to use of materials such as tape, labels, and marking fluids which in the past have produced residual chlorides.

12542 (SR/H–678) **Corrosion evaluated type 304L and 308L stainless steel for Savannah River Plant: Specification No. 4498: Revision 1.** Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 4 Nov 1964. 7p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94007138. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This specification covers wrought mill products and castings of Type 304L stainless steel, bare welding rod or wire, or covered welding electrodes of Type 308L stainless steel. The material covered by this specification is intended for service in nitric acid or in other services where stainless steel with freedom from corrosion by intergranular attack is required. This specification is intended to designate the acceptable standard mill products, the methods of sampling, the methods for conducting the corrosion evaluation tests, and the requirements for acceptance. A supplement to this specification shall be furnished the supplier for the following cases where required: (a) special fabrication methods; (b) control of carbon content to a maximum of 0.03% in the strip or in the finished tubular products; (c) corrosion evaluation of strip prior to forming welded tubing; (d) special cleaning methods; (e) special surface conditions; (f) special inspection requirements; and (g) other features not included in either this specification or in the applicable ASTM specification.

12543 (UCRL-CR–114777) **On the formation of μ- and ζ-phases in Ag-Al system by mechanical alloying.** Paruchuri, M.R. (Carnegie Mellon Univ., Pittsburgh, PA (United States). Dept. of Materials Science and Engineering); Zhang, D.L.; Massalski, T.B. Lawrence Livermore National Lab., CA (United States); Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Materials Science and Engineering. Sep 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007125. Source: OSTI; NTIS; GPO Dep.

Pure silver and aluminum powders have been mechanically alloyed in a Spex mill. Four selected nominal compositions $Ag_{1-x}Al_x$ (x = 0.20, 0.23, 0.26 and 0.37) were investigated by X-ray diffraction and differential scanning calorimetry, after being subjected to different times of ball milling. In all four selected compositions, the close packed hexagonal intermediate λ-phase and the fcc α-phase (Ag-based solid solution) formed together during the first hour of milling, but subsequently the λ-phase disappeared during continued milling except in the two alloys corresponding to 26 at.%Al and 37 at.%Al where the λ-phase is the equilibrium phase. With continued milling, the complex cubic μ-phase formed in the alloys of nominal composition 20, 23 and 26 at.%Al where it is expected in equilibrium alloys. No amorphous phases have been observed in the mechanically alloyed powders in this system.

12544 (UCRL-CR–115387) **Cubic to tetragonal crystal lattice reconstruction during ordering or decomposition.** Cheong, Byung-kl (Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Materials Science and Engineering). Lawrence Livermore National Lab., CA (United States); Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Materials Science and Engineering. 1 Sep 1992. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007923. Source: OSTI; NTIS; GPO Dep.

Thesis submitted to Carnegie Institute of Technology, Pittsburgh PA.

This thesis studied thermodynamic stability and morphology of product phases in diffusional phase transformations involving cubic-to-tetragonal crystal lattice reconstructions. Two different kinds of diffusional transformations were examined: $L1_0$ ordering (fcc to fct lattice change) and decomposition of off-stoichiometric B2 ordering alloys accompanying bcc to fcc Bain transformation. In the first case, Fe-45 at.% Pd alloys were studied by TEM; in the second, the Bain strain relaxation during decomposition of hypereutectoid Cu-9.04 wt% Be alloy was studied. CuAu and InMg were also studied.

12545 (UCRL-ID–116376) **Summary report for nanoscale magnetics.** Tobin, J.G.; Waddill, G.D.; Jankowski, A.F.; Tamura, E.; Sterne, P.A.; Pappas, D.P.; Tong, S.Y. Lawrence Livermore National Lab., CA (United States). 23 Sep 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007468. Source: OSTI; NTIS; GPO Dep.

We have probed the electronic, geometric, and magnetic nanoscale structure of ultrathin magnetic films, both monolayers and multilayers (Fe/Cu(001), FePt, FeCoPt, UFe_2, U-S). Techniques used included the MCD (magnetic circular dichroism)-variants of of x-ray absorption, core-level photoemission, and photoelectron diffraction. Progress has been made on nanoscale structure-property relations, in part of coupling of world-class experimentation and theoretical modeling. Feasibility of investigations of 5f magnetism using bulk uranium samples also has been demonstrated.

12546 (UCRL-JC–114136) **Resonant photoemission and magnetic x-ray circular dichroism in the M shell of ultrathin films of Fe.** Tobin, J.G.; Waddill, G.D. Lawrence Livermore National Lab., CA (United States). 27 Sep 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931133–8: 38. annual conference on magnetism and magnetic materials, Minneapolis, MN (United States), 15-18 Nov 1993). Order Number DE94007453. Source: OSTI; NTIS; INIS; GPO Dep.

Using magnetic ultra thin films (2–4 ml) of Fe on Cu(001) and bulk-like Fe, the Fe3p and Fe3s core states have been investigated with resonant photoemission and core-level photoemission, including, magnetic x-ray circular dichroism (MXCD) experiments. The resonant photoemission experiment has been done in fine steps over a wide photon energy range ($h\nu$ = 695 eV – 715 eV), to probe the parentage of various spectral structures. The onset of secondary channels at the L_3($h\nu$ = 707 eV) and L_2($h\nu$ = 720 eV) edges will be analyzed in light of results from bulk Ni. The MXCD photoelectron spectroscopy of the Fe3p exhibits a 0.2 eV shift with circular polarization variation. The previously observed split peak structure in the Fe3s will be discussed with regard to the new resonant photoemission results. The resonant photoemission results will also be put into the context of our MXCD absorption results for monolayer and multilayers of Fe.

12547 (UCRL-JC–114159-Pt.2) **Boron and hydrogen in Ni_3Al: Part 2, Mechanical testing of bicrystals.** Johnson, P.E. (Lawrence Livermore National Lab., CA (United States)); Gourdin, W.; Gonis, A.; Kioussis, N.; Vaudin, M. Lawrence Livermore National Lab., CA (United States). 4 Jan 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–84-Pt.2: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94007441. Source: OSTI; NTIS; GPO Dep.

To provide a sensitive measurement of the effect of boron segregation on the strength and ductility of Ni_3Al grain boundaries, bicrystal tensile tests were performed on small specimens of boron doped $Ni_{76}Al_{24}$ cut from extremely large-grained boules. Five specimens with the same "random" or low-symmetry grain boundary (disorientations measured by means of backscattered Kikuchi patterns) and two specimens with a second random grain boundary were tested in quenched and slow-cooled conditions. Duplicate tests performed in a low (7 ppM) water-vapor environment showed that the fracture mode and the stress and strain at fracture are altered by environmental embrittlement at individual, partially strengthened grain boundaries.

12548 (UCRL-JC–114794) **Element-specific magnetic hysteresis measurements, a new application of circularly polarized soft x-rays.** Lin, H.J. (AT and T Bell Labs., Murray Hill, NJ (United States)); Chen, C.T.; Meigs, G.; Idzerda, Y.U.; Chaiken, A.; Prinz, G.A.; Ho, G.H. Lawrence Livermore National Lab., CA (United States). 7 Sep 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930722–59: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE94007122. Source: OSTI; NTIS; GPO Dep.

Element-specific magnetic hysteresis measurements on heteromagnetic materials have been achieved by using circularly polarized soft-x- rays. Dramatically different Fe and Co hysteresis curves of Fe/Cu/Co trilayers were obtained by recording the magnetic circular dichroism (MCD) at their respective L_3 white lines as a function of applied magnetic field. The data resolve the complicated hysteresis curves, observed by conventional magnetometry, and determine the individual magnetic moments for the Fe and Co layers. Fine hysteresis features, imperceptible in the conventional

curves, were also observed, demonstrating a new application of circularly polarized soft-x-rays in the investigation of magnetic systems.

12549 (UCRL-JC–114908) **Tantalum-base materials for molten plutonium containment.** Gdowski, G.E. (Lawrence Livermore National Lab., CA (United States)); Bronson, M.C.; Dodson, K.E. Lawrence Livermore National Lab., CA (United States). Oct 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940215–5: International symposium on actinides: processing and materials, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94006721. Source: OSTI; NTIS; INIS; GPO Dep.

Operating conditions for the pyrochemical processing of plutonium severely restricts materials choices for process components. Pure tantalum has many desirable properties as a construction material; it has a high melting point and low solubility in molten plutonium at processing temperatures. However it has limitations because it is susceptible to intergranular attack and is wetted by molten plutonium. Tantalum-carbon base materials have been developed to overcome the limitations of pure tantalum. Different materials are used depending on the requirements of the operating conditions. Carbide coated tantalum is used for components, such as stirrers, that do not remain in contact with significant amounts of solidifying material. A tantalum-carbon base alloy has been developed for components, such as crucibles, that are in contact with solidifying plutonium.

12550 (UCRL-JC–116117) **Recent advances and developments in refractory alloys.** Nieh, T.G.; Wadsworth, J. Lawrence Livermore National Lab., CA (United States). Nov 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–90: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94007929. Source: OSTI; NTIS; GPO Dep.

Refractory metal alloys based on Mo, W, Re, Ta, and Nb (Cb) find applications in a wide range of aerospace applications because of their high melting points and high-temperature strength. This paper, presents recent progress in understanding and applications of these alloys. Recent studies to improve the oxidation and mechanical behavior of refractory metal alloys, and particularly Nb alloys, are also discussed. Some Re structures, for extremely high temperature applications (> 2000C), made by CVD and P/M processes, are also illustrated. Interesting work on the development of new W alloys (W-HfC-X) and the characterization of some commercial refractory metals, e.g., K-doped W, TZM, and Nb-1%Zr, continues. Finally, recent developments in high temperature composites reinforced with refractory metal filaments, and refractory metal-based intermetallics, e.g., Nb_3Al, Nb_2Be_{17}, and $MoSi_2$, are briefly described.

12551 (VAEC-B–021) **Production of amorphous metal layers using ion implantation and investigation of the related modification of some surface properties.** Hoang Dac Luc; Vu Hoang Lam. Viet Nam National Atomic Energy Commission, Ha Noi (Viet Nam). 29 Nov 1993. 12p. Order Number DE94617509. Source: OSTI; NTIS (US Sales Only); INIS.

Preprint.

Amorphous layers were produced by implanting B^+ ions into Al at 50 keV. The modification of the electrochemical corrosion resistance and the mechanical strength of implanted specimen was investigated. (author). 2 refs, 1 tab, 2 figs.

12552 (WSRC-MS–94-080) **Modeling of residual stress mitigation in austenitic stainless steel pipe girth weldment.** Li, M. (Oregon Graduate Inst., Portland, OR (United States)); Atteridge, D.G.; Anderson, W.E.; West, S.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931234–8: American Welding Society international conference on modeling and control of joining processes, Orlando, FL (United States), 8-10 Dec 1993). Order Number DE94007184. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides numerical procedures to model 40-cm-diameter, schedule 40, Type 304L stainless steel pipe girth welding and a newly proposed post-weld treatment. The treatment can be used to accomplish the goal of imparting compressive residual stresses at the inner surface of a pipe girth weldment to prevent/retard the intergranular stress corrosion cracking (IGSCC) of the piping system in nuclear reactors. This new post-weld treatment for mitigating residual stresses is cooling stress improvement (CSI). The concept of CSI is to establish and maintain a certain temperature gradient across the pipe wall thickness to change the final stress state. Thus, this process involves sub-zero low temperature cooling of the inner pipe surface of a completed girth weldment, while simultaneously keeping the outer pipe surface at a slightly elevated temperature with the help of a certain heating method. Analyses to obtain quantitative results on pipe girth welding and CSI by using a thermo-elastic-plastic finite element model are described in this paper. Results demonstrate the potential effectiveness of CSI for introducing compressive residual stresses to prevent/retard IGSCC. Because of the symmetric nature of CSI, it shows great potential for industrial application.

12553 (WSRC-MS–94-081) **Thermomechanical history measurements on Type 304L stainless steel pipe girth welds.** Li, Ming (Oregon Graduate Inst., Portland, OR (United States)); Atteridge, D.G.; Anderson, W.E.; Turpin, R.; West, S.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-931234–7: American Welding Society international conference on modeling and control of joining processes, Orlando, FL (United States), 8-10 Dec 1993). Order Number DE94007183. Source: OSTI; NTIS; INIS; GPO Dep.

Thermal and strain histories were recorded for three 40-cm-diameter (16 inch), Type 304L stainless steel (SS), schedule 40 (1.27 cm thickness) pipe girth welds. Two weld groove preparations were standard V grooves while the third was a narrow groove configuration. The welding parameters for the three pipe welds simulated expected field practice as closely as possible. The narrow gap weld was completed in four continuous passes while the other two welds required six and nine (discontinuous) passes, due to the use of different weld wire diameters. Thermomechanical history measurements were taken on the inner counterbore surface, encompassing the weld centerline and heat-affected zone (HAZ), as well as 10 cm of inner counterbore surface on either side of the weld centerline; a total of 47 data acquisition instruments were used for each weld. These instruments monitored: (1) weld shrinkages parallel to the pipe axis; (2) surface temperatures; (3) surface strains parallel to weld centerline; and (4) radial deformations. Results show that the weld and HAZ experienced cyclic deformation in the radial direction during welding, indicating that the final residual stress distribution in multi-pass pipe weldments is not axisymmetric. Measured radial and axial deformations were smaller for the narrow gap groove than for the standard V grooves, suggesting that the narrow gap groove weldment may have lower residual stress levels than the standard V groove weldments. This study provides the experimental database and a guideline for further computational modeling work.

12554 (WSRC-TR–93-595) **Potential for erosion corrosion of SRS high level waste tanks.** Zapp, P.E. Westinghouse Savannah River Co., Aiken, SC (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007145. Source: OSTI; NTIS; INIS; GPO Dep.

SRS high-level radioactive waste tanks will not experience erosion corrosion to any significant degree during slurry pump operations. Erosion corrosion in carbon steel structures at reported pump discharge velocities is dominated by electrochemical (corrosion) processes. Interruption of those processes, as by the addition of corrosion inhibitors, sharply reduces the rate of metal loss from erosion corrosion. The well-inhibited SRS waste tanks have a near-zero general corrosion rate, and therefore will be essentially immune to erosion corrosion. The experimental data on carbon steel erosion corrosion most relevant to SRS operations was obtained at the Hanford Site on simulated Purex waste. A metal loss rate of 2.4 mils per year was measured at a temperature of 102 C and a slurry velocity comparable to calculated SRS slurry velocities on ground specimens of the same carbon steel used in SRS waste

tanks. Based on these data and the much lower expected temperatures, the metal loss rate of SRS tanks under waste removal and processing conditions should be insignificant, i.e. less than 1 mil per year.

3602 Ceramics, Cermets, and Refractories

Refer also to citation(s) 11498, 11943, 12054, 12480, 12549, 12595, 12782, 12817, 13914, 13920, 14079, 14089, 14121, 14122, 14123, 14124, 14126, 14127, 14128, 14129, 14130, 14146, 14202, 14206

12555 (ANL/MCT/PP–71579) **Mechanical properties of vacuum-sintered yttria ceramics.** Wagh, A.S.; Roberts, D.; Suratwala, T.; McMann, M.; Poeppel, R.B. Argonne National Lab., IL (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008138. Source: OSTI; NTIS; GPO Dep.

Mechanical properties of vacuum sintered dense yttria ceramics have been studied. Values of flexural strength, fracture toughness and thermal shock behavior, better than those reported in the literature, are reported. Microscopic investigations reveal elastic strain energy and cleavage step formation as the major contributors to the fracture energy.

12556 (ANL/MCT/PP–71813) **Effect of grain size on strain in $YBa_2CU_3O_{7-x}$ using neutron diffraction.** Kupperman, D.S.; Singh, J.P.; Hitterman, R.L. Argonne National Lab., IL (United States). Oct 1990. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008122. Source: OSTI; NTIS; GPO Dep.

The anisotropic expansion and contraction of $YBa_2Cu_3O_{7-x}$ (YBCO) grains during fabrication could lead to internal stresses that may be relieved by microcracking resulting in low critical currents. Neutron diffraction techniques have been used to examine the internal strain as a function of grain size in samples of YBCO. The full width at half maximum (FWHM) of the Gaussian shaped diffraction peaks are used for the strain analysis. The FWHM in the strain distribution for the coarse grain material is found to be about 0.05%. The strain variation for the fine grained material on the other hand is significantly larger and is about 0.3%. Results of this study suggests the strains are relieved by microcracking in coarse grained YBCO.

12557 (ANL/MCT/PP–72080) **Use of neutron diffraction to determine grain-size effects on strain in $YBa_2CU_3O_{7-x}$.** Kupperman, D.S.; Singh, J.P.; Hitterman, R.L. Argonne National Lab., IL (United States). Oct 1990. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008121. Source: OSTI; NTIS; GPO Dep.

Anisotropic expansion and contraction of $YBa_2Cu_3O_{7-x}$ (YBCO) grains during fabrication could lead to internal stresses that may be relieved by microcracking, resulting in low strength and critical current density. Neutron diffraction techniques have been used to examine the internal strain distribution as a function of grain size in YBCO samples. The full width at half maximum (FWHM) of the Gaussian shaped diffraction peaks is used for strain distribution analysis. The FWHM of the strain distribution for coarse-grain YBCO is found to be about 0.05%, while that for fine-grain material is significantly higher at about 0.3%. Results of this study suggest that the strains are relieved by microcracking in coarse-grain YBCO.

12558 (ANL/MCT/PP–72124) **Isothermal sintering, microstructure and superconducting properties of $Y_1Ba_2Cu_3O_{7-x}$ compound.** Viswanath, R.N. (Madras Univ. (India). Dept. of Nuclear Physics); Ramasmay, S.; Schaper, W.; Gehrke, K.; Balachandran, U. Argonne National Lab., IL (United States). [1994]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008132. Source: OSTI; NTIS; GPO Dep.

Polycrystalline $Y_1Ba_2Cu_3O_{7-x}$ was prepared by the solid state reaction method and characterized by x-ray powder diffraction method, Meissner effect, resistivity by four probe method and iodometric titrations. The material was processed at 930C and isothermal sintering behavior up to 96 was studied using positron lifetime, x-ray powder diffraction (SEM), four probe method for resistivity and critical current vs magnetic field and differential thermal analysis (DTA). Two types of grain morphology are, observed by SEM, one below 36 and one above 36 sintering. DTA show one peak around 954C, above 36 sintering. Positron lifetime results reveal that the lifetime values and τ_1 and τ_2 arise from positron trapping in strained/deformed regions and-microvoids formed in the triple defect junctions (TDJ), respectively. Size of defect responsible for the pinning centers is estimated from positron lifetime data. Reasons for the lesser value of transport J_c (24.72 A/cm^2), obtained in the compound sintered at 930C are explained. Nature of defects related to the resistivity component in the compound is also discussed.

12559 (ANL/MSD/CP–82175) **Effect of twin boundary density on the vortex melting transition in $YBa_2Cu_3O_{7-\delta}$ single crystals.** Kwok, W.K. (Argonne National Lab., IL (United States)); Fleshler, S.; Welp, U.; Crabtree, G.W.; Fendrich, J. Argonne National Lab., IL (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR 91-20000. (CONF-940122–2: 7. IWCC international workshop on critical currents in superconductors, Alpbach (Austria), 24-27 Jan 1994). Order Number DE94007684. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present magnetotransport ρ(H,T) measurements in clean untwinned and twinned crystals of $YBa_2Cu_3O_{7-\delta}$ in magnetic fields up to 8 Tesla for H || c. In untwinned crystals, they show strong support for a vortex solid to liquid first order melting transition at a temperature T_m, much below the mean field transition temperature T_c(H), characterized by an extremely sharp drop in resistivity $\rho(T_m)$ and the appearance of hysteretic behavior at $\rho(H_m)$. In densely twinned crystals, the sharp transition is replaced with a continuous transition at a higher temperature $T_{BG} > T_m$. Furthermore, the cusp in $T_{BG}(\theta)$ predicted by the Bose glass theory at fixed field is observed. In dilutely twinned crystals they demonstrate the competing effect of pinning and freezing at the phase transition. The vortex solid state at low fields is characterized by the appearance of a "peak effect" just below the melting temperature.

12560 (ANL/MSD/PP–71896) **Implications of Hund's second rule for the insulating behavior of FeO and CoO.** Norman, M.R. Argonne National Lab., IL (United States). Nov 1990. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008126. Source: OSTI; NTIS; GPO Dep.

A formal expression for Hund's second rule correlations is applied to energy band calculations for FeO, CoO, and NiO. In all 3 cases, insulating gaps are found, in contrast to standard band calculations, where an insulating gap is only found for NiO. The calculated orbital moments, though, are too large, due to the correction being based on the atomic limit. 2 tabs, 12 refs.

12561 (ANL/MSD/PP–77692) **Extended-range order in glasses.** Ellison, A.J.G. (Argonne National Lab., IL (United States)); Price, D.L.; Saboungi, M.L.; Egami, T.; Hu, Rui-Zhong; Howells, W.S. Argonne National Lab., IL (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008135. Source: OSTI; NTIS; GPO Dep.

A new type of order is identified in complex glasses, characterized by diffraction peaks at values of the wave vector below those typical of intermediate-range order. Combined neutron and anomalous x-ray diffraction studies of one glass exhibiting this behavior, vitreous rubidium germanate, indicate it to be associated with chemical ordering of the two cations with respect to each other.

12562 (BARC–1993/E/017) **Digital control programmer for temperature control.** Rajore, S.B. (Bhabha Atomic Research Centre, Bombay (India). Radiochemistry Div.); Kumar, S.V. Bhabha Atomic Research Centre, Bombay (India). 1993. 39p. Order Number DE94615584. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes a PC based digital control programmer for controlling and programming temperature of a high vacuum resistance heating furnace and the software developed to control power

using PID algorithm. It also describes the amplifier specially developed to suit the input requirement of the non-standard W5 thermocouple and the software and hardware protections introduced in the system. (author). 5 refs., 8 figs., 1 appendix.

12563 (CONF-930956–2) **Microanalysis of an oxidized cobalt oxide: Zirconia eutectic.** Bentley, J. (Oak Ridge National Lab., TN (United States)); McKernan, S.; Carter, C.B.; Revcolevschi, A. Oak Ridge National Lab., TN (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-84OR21400. Grant DMR-8901218. From Biennial conference of the Electron Microscopy and Analysis Group of the Institute of Physics: recent advances in electron microscopy and related microanalytical techniques; Liverpool (United Kingdom); 14-17 Sep 1993. Order Number DE94007209. Source: OSTI; NTIS; GPO Dep.

The compositions of CoO, Co_3O_4, and Ca-stabilized cubic ZrO_2 in an oxidized directionally solidified CoO-ZrO_2 eutectic were determined by PEELS and EDS. An oxygen gradient exists across the Co_3O_4 with highest levels near the ZrO_2 interface. Oxygen ELNES for CoO and Co_3O_4 are quite different; published oxygen ELNES have been incorrectly attributed to CoO. Normalized Co-L_{23} white line intensity (WLI) ratios for CoO and Co_3O_4 are similar (0.53 ± 0.02) but L_3/L_2 WLI ratios are 3.88 and 2.58, respectively. ELCE data suggest Co_3O_4 has the inverse spinel structure.

12564 (CONF-931009–20) **The path for long range conduction in high J_c $TlBa_2Ca_2Cu_3O_{8+x}$ spray-pyrolyzed deposits.** Kroeger, D.M. (Oak Ridge National Lab., TN (United States)); Goyal, A.; Specht, E.D.; Wang, Z.L.; Tkaczyk, J.E.; Sutliff, J.A.; DeLuca, J.A. Oak Ridge National Lab., TN (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials; Pittsburgh, PA (United States); 17-21 Oct 1993. Order Number DE94007211. Source: OSTI; NTIS; GPO Dep.

Grain boundary misorientations and local texture in polycrystalline $TlBa_2Ca_2Cu_3O_{8+x}$ deposits prepared by thallination of spray-pyrolyzed precursor deposits on yttria-stabilized zirconia have been determined from transmission electron microscopy, electron backscatter diffraction patterns and x-ray diffraction. The deposits were polycrystalline, had small grains, and excellent c-axis alignment The deposits contained colonies of grains with similar but not identical a-axis orientations. Most grain boundaries within a colony have small misorientation angles and should not be weak links. It is proposed that long range current flow occurs through a percolative network of small angle grain boundaries at colony intersections.

12565 (CONF-931108–70) **Enhancement of oxidation resistance of silicon carbide by high-dose and multi-energy aluminum implantation.** Yang, Z. (Stevens Inst. of Tech., Hoboken, NJ (United States)); Du, H.; Libera, M.; Withrow, S.P.; Casas, L.M.; Lareau, R.T. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-84OR21400. Grant MSS-9110256. From Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 dec 1993. Order Number DE94006560. Source: OSTI; NTIS; GPO Dep.

High-dose and multi-energy aluminum implantation of α-SiC (0001) was carried out to achieve a broad aluminum distribution extending from the sample surface to a depth of approximately 350 nm. Oxidation resistance of the implanted crystals was studied in 1 atm flowing oxygen at 1300C. Aluminum implantation resulted in a 45% improvement in the oxidation resistance of α-SiC as compared with unimplanted crystals due to the formation of structurally dense mullite ($3Al_2O_3.2SiO_2$) in the oxidation scale.

12566 (CONF-9311153–2) **Compositions and chemical bonding in ceramics by quantitative electron energy-loss spectrometry.** Bentley, J. (Oak Ridge National Lab., TN (United States)); Horton, L.L.; McHargue, C.J.; McKernan, S.; Carter, C.B.; Revcolevschi, A.; Tanaka, S.; Davis, R.F. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00033. Grant DMR-8901218. From Materials Research Society meeting; Pittsburgh, PA (United States); 29 Nov - 3 dec 1993. Order Number DE94007208. Source: OSTI; NTIS; GPO Dep.

Quantitative electron energy-loss spectrometry was applied to a range of ceramic materials at a spatial resolution of <5 nm. Analysis of Fe L_{23} white lines indicated a low-spin state with a charge transfer of ~1.5 electrons/atom onto the Fe atoms implanted into (amorphized) silicon carbide. Gradients of 2 to 5% in the Co:O stoichiometry were measured across 100-nm-thick Co_3O_4 layers in an oxidized directionally solidified CoO-ZrO_2 eutectic, with the highest O levels near the ZrO_2. The energy-loss near-edge structures were dramatically different for the two cobalt oxides; those for Co_3O_4 have been incorrectly ascribed to CoO in the published literature. Kinetically stabilized solid solubility occurred in an AlN-SiC film grown by low-temperature molecular beam epitaxy (MBE) on α(6H)-SiC, and no detectable interdiffusion occurred in couples of MBE-grown AlN on SiC following annealing at up to 1750C. In diffusion couples of polycrystalline AlN on SiC, interfacial 8H sialon (aluminum oxy-nitride) and pockets of Si_3N_4-rich β' sialon in the SiC were detected.

12567 (CONF-931257–1) **Properties of doped and undoped (Ca,Sr)CuO_2 thin films.** Norton, D.P.; Chakoumakos, B.C.; Budai, J.D.; Jones, E.C.; Christen, D.K.; Lowndes, D.H. Oak Ridge National Lab., TN (United States). Dec 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Electro Technical Laboratory (ETL) workshop on high temperature superconductors; Tokyo (Japan); 6-10 Dec 1993. Order Number DE94007230. Source: OSTI; NTIS; GPO Dep.

The authors have studied the transport and structural properties of (Ca,Sr)CuO_2, $Sr_{1-y}Nd_yCuO_2$, and $Sr_{1-x}CuO_{2-\delta}$ thin films grown by pulsed-laser deposition. Stoichiometric "infinite layer" (Ca,Sr)CuO_2 thin films grown over a large range of growth conditions are insulators, while superconductivity is observed in $Sr_{1-y}Nd_yCuO_2$ films with T_c(onset) ~28 K for y = 0.10. A Nd solubility limit of y = 0.10 is observed with the appearance of a new phase with c ~ 0.37 nm for y > 0.10. In addition, the transport and structural properties of $Sr_{1-x}CuO_{2-\delta}$ thin films grown by pulsed-laser deposition support the contention that the tetragonal phase is capable of accommodating a significant density of alkaline-earth deficiencies up to x ≤ 0.3. Resistivity measurements indicate a significant change in the carrier density of the CuO_2 planes as Sr vacancies are introduced. In addition, an enigmatic anomaly in resistivity at 185 K is observed for $Sr_{0.85}CuO_{2-\delta}$ thin films. Magnetic measurements on these samples indicate that, although a significant drop in resistivity at 185 K is observed, it is not due to a superconducting transition. Hall measurements, as well as changes in resistivity with film growth conditions, suggest that the majority carriers in these $Sr_{1-x}CuO_{2-\delta}$ thin films are electrons even with the Sr-vacancies present.

12568 (CONF-940135–3) **Effects of oxidation and creep damage mechanisms on creep behavior in HIPed silicon nitrides.** Wereszczak, A.A.; Ferber, M.K.; Kirkland, T.P. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 9-14 Jan 1994. Order Number DE94006559. Source: OSTI; NTIS; GPO Dep.

The creep resistance of hot-isostatically pressed (HIPed) silicon nitride materials is ultimately dictated by its susceptibility to creep enhanced damage (e.g. cavitation) and oxidation induced damage. The evolution of these simultaneously occurring events has been examined in several HIPed silicon nitrides which were tested in tension at elevated temperatures. The activity and extent of each have found to be functions of several variables. These parameters and their roles are discussed and include the following: initial α/β ratio of silicon nitride grains, reaction of stable/unstable phases in the as-received material, percentage and type of sintering aid, and grain boundary crystallinity, impurity content, and viscosity.

12569 (DOE/ER/45482–1) **Fabrication, phase transformation studies and characterization of SiC-AlN-Al_2OC ceramics: [Annual report, February 1, 1993–July 30, 1993].** Virkar, A.V.;

Tian, Qiang; Chen, Jong. Utah Univ., Salt Lake City, UT (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER45482. Order Number DE94008587. Source: OSTI; NTIS; GPO Dep.

During the first year of the above grant, research has been conducted in three years: (1) Research underway on the effect of coherency strains on phase separation in the AlN-Al_2OC was written into a manuscript. (2) A study of interdiffusion in the SiC-AlN system was initiated. (3) Work on theoretical analysis for determination of symmetry of morphology of phase separation in a hexagonal system was initiated. A brief description of the progress during the past six months is given, followed by a summary of work planned for next year.

12570 (EGG-SCM–10713) **Joining of silicon nitrides using oxynitride glasses.** O'Brien, M.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008517. Source: OSTI; NTIS; GPO Dep.

This report presents a study on commercial silicon nitrides that were successfully joined using oxynitride glasses. Sintered silicon nitride was joined by either closed or glass-filled joints. Glass-filled joints were successfully used on hot-pressed silicon nitrides and were comparable in fast fracture strength to unjoined silicon nitrides up to approximately 1000C. Above that temperature, strengths decreased rapidly and glass flow failure began. The study observed that time-dependent failure currently limits the service temperatures of glass-filled joints. Creep failure occurred in excess of 1000C. Between 900 and 1000C, slow crack growth failure was observed. Cavitation (or viscous deformation) was the rate-controlling mechanism of slow crack growth.

12571 (ETDE-IT–94-20) **Nanocrystalline AL_2 O_3 powder produced by laser induced gas phase reactions.** Borsella, E. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Botti, S.; Martelli, S.; Zappa, G.; Giorgi, R.; Turt, S. No corporate text available. 1993. 5p. (CONF-930927–3: 3. conference of the European Ceramic Society, Madrid (Spain), 13-17 Sep 1993). Order Number DE94752539. Source: OSTI; NTIS (US Sales Only).

Nanocrystalline Al_2O_3 powders were successfully synthesized by a CO_2 laser-driven gas-phase reaction involving trimethylaluminium ($Al(CH_3)_3$) and nitrous-oxide (N_2O). Ethylene (C_2H_4) was added as gas sensitizer. The as-synthesized powder particles showed a considerable carbon contamination and an amorphous-like structure. After thermal treatment at 1200-1400 degrees C, the powder was transformed to hexagonal a-Al_2O_3 with very low carbon contamination as confirmed by X-ray diffraction, X-ray photo-electron spectroscopy and chemical analysis. The calcinated powders resulted to be spherical single crystal nanoparticles with a mean size of 15-20 nm, as determined by X-ray diffraction, electron microscopy and B.E.T. specific surface measurements. The laser synthesized Al_2O_3 particles are well suited dispersoids for intermetallic alloy technology.

12572 (INIS-mf–13749, pp. 49) **Brillouin scattering study of the phase transition in Tl In S_2 and Tl Ga Se_2.** Sardarly, R.M. (Institute of Radiation Investigations, Baku (Azerbaijan)); Sadikhov, I.Sh.; Samedov, O.A.; Ismailov, N.M.; Ismailov, G.M. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GALLIUM SELENIDES/brillouin effect; INDIUM SULFIDES/brillouin effect; TELLURIUM SULFIDES/brillouin effect; BACKSCATTERING; PHASE TRANSFORMATIONS; PHOTOACOUSTIC EFFECT

12573 (INIS-mf–13749, pp. 70) **Raman study of structural instability in In Se intercalated with Gallium Sulfide.** Zolfaghari, M. (Indian Inst. of Tech., New Dehli (India). Laser Technology Reseach Programme); Jain, K.P.; Abbi, S.C. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 27.

Short communication. INDIUM SELENIDES/raman spectroscopy; EXCITONS; GALLIUM SULFIDES; LASER RADIATION; SCATTERING

12574 (INIS-mf–13749, pp. 76) **Perovskite thin film produced by laser ablation techniques.** Safari, A. (New Jersey State Univ., Piscataway, NJ (United States). Dept. of Ceramic Engineering). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PEROVSKITE/laser radiation; ABLATION; DEPOSITION; PEROVSKITE; THIN FILMS

12575 (INIS-mf–13749, pp. 103) **Optical waveguide on the basis of dielectric matrix and semiconductive micro crystallites.** Muradov, M.B. (Baku State Univ., (Azerbaijan). Physics Dept.). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CADMIUM SULFIDES/waveguides; WAVEGUIDES; CRYSTALS; GELS; GLASS; ION EXCHANGE; LASER MATERIALS; MATRIX MATERIALS; POTASSIUM NITRATES; REFRACTIVE INDEX; SIZE

12576 (INIS-mf–14178) **Structural characterization of high-Tc superconductors.** Worzala, H.; Wilde, W.; Jost, K. Zentralinstitut fuer Anorganische Chemie, Berlin (Germany). Jun 1991. 29p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 30L2018B. Order Number DE94747622. Source: OSTI; NTIS (US Sales Only); INIS.

The studies reported were intended to yield information on the relationships between synthesis, structure and properties of high-Tc superconductors. The synthesis and structure of the 124-phase in the system YBaCu and those of the 2223-phase in the Bi-system were given most attention. It was possible to ascertain a reproducible way of synthetizing a pure product, and a product where Y is replaced by 0.1 mole of Ca. The reaction mechanism was characterized by X-ray diffraction analysis. As regards the 2223-phase in the Bi-system, results show a connection between an annealing process in O_2 and the crystallographic parameters and superconductivity. (orig./MM)

12577 (INIS-mf–14181) **Investigation of HTSC; influence of microstructure, magnetic and of non-magnetic impurities; synthesis of new systems: Final report.** Wohlleben, D. Koeln Univ. (Germany). Lehrstuhl fuer Angewandte Physik. 1991. 16p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 13N5494. Order Number DE94747579. Source: OSTI; NTIS (US Sales Only); INIS.

We have investigated intensively the parameters of preparation of HTSC of the BiCaSrCuO system and could prepare the 2212- and 2232 phases separately in X-ray pure form. Concerning the 123-system the substitution of Cu by 3d-elements changed the superconducting behaviour strongly where as a replacement of Y by other Rare Earth-elements does not influence much the superconducting properties. Fluctuations occur in a wide range around T_c. The layered-structure and granular character of the HTSC determine strongly the magnetic behaviour of HTSC especially the so-called Meissnereffect. Our first magnetic data of HTSC showed that even in magnetic fields smaller than Hc_1 (perpendicular) we

did not receive 100% fluxexpulsion (Meissner). The fluxexpulsion of most of our samples was only 1/3 of -1/4 π. However in very small fields (< 1 G) we found 100% Meissnereffect. For studying this behaviour more thoroughly we are installing now a Foner- and Squidmagnetometer, which are both more sensitive in low field in comparison with the normally used Faraday-balance. A model for the field-dependent fluxexpulsion of HTSC is in preparation. (orig.)

12578 (IPEN-PUB-389) **The sintering of dioxide pellets (UO_2) in an oxidizing atmosphere (CO_2).** Santos, G.R.T. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Riella, H.G. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). Jun 1993. 17p. (In Portuguese). Order Number DE94615585. Source: OSTI; NTIS (US Sales Only); INIS.

In this study the process of sintering of U O_2 pellets in oxidative atmosphere has been evaluated. Temperature and time of study have been varied in order to determine the influence of these parameters on final density and microstructure of the material. The NIKUSI process, allows to work in a temperature range below to those that have been employed in the conventional process, lowering in up to 50% the sintering cycle because it is possible to decrease the time of sintering. (author).

12579 (ITP-93-30E) **About mid-infrared optical spectrum of high-T_c superconducting compounds.** Loktev, V.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. Order Number DE94615646. Source: OSTI; NTIS (US Sales Only); INIS.

The simple model for spin-allowed d d-excitations in copper containing high-T_c superconductors (HTSC) is proposed. The Hamiltonian of the system and the operator of its interaction with the light which reflects the quadrupole and spin structure of these excitations are obtained. An attempt is made to interpret the absorption spectrum experimentally observed in the region of copper dd-transitions. (author). 13 refs.

12580 (ITP-93-37E) **Twin spacing and the structural phase transitions in 1:2:3 high-T_c superconductors.** Nikolaev, V.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 11p. Order Number DE94615647. Source: OSTI; NTIS (US Sales Only); INIS.

The properties of the structural twins in 1:2:3 compounds are investigated in a wide range of temperatures in the frame of the suggested model. The dependence of the size of the twins versus temperature is considered. The temperature interval of the sharp increase of twin size with increase of the temperature is found. (author). 12 refs. 5 figs.

12581 (Juel-2725) **Perovskite $La_{1-x}Sr_xMnO_{3-\delta}$ as cathode material for high-temperature fuel cells: Powder fabrication, shaping and characterization.** Li, Z. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Angewandte Werkstofforschung); Stoever, D.; Scherberich, F.D.; Behruzi, M. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Angewandte Werkstofforschung. Feb 1993. 53p. (In German). Order Number DE94752367. Source: OSTI; NTIS (US Sales Only).

Perovskite $La_{1-x}Sr_xMnO_{3-\delta}$-powder with an Sr-content of 0.0 to 0.9 mole were produced by the solid-state reaction. They were plasma sprayed to fabricate coating samples and uniaxial pressing-sintering was used for shaping bodies. Sample properties investigated are stochiometry, crystal structure, phase transformation, thermal expansion, electrical conductivity up to 1000 C and the behavior of the powder during processing. Determined properties as a function of composition, oxygen and Mn^{4+}-ion concentration, temperature and processing method indicate that $La_{1-x}Sr_xMnO_{3-\delta}$ materials with high electrical conductivity and a suitable coefficent of thermal expansion can be produced based on a definite crystal structure. These materials have a potential applicability in fabricating SOFC (Solid Oxide Fuel Cells). (orig.)

12582 (LA-SUB-94-41) **Chemical vapor deposition of metal nitrides, phosphides and arsenides: Final report.** Hoffman, D.M. (Univ. of Houston, TX (United States). Dept. of Chemistry). Los Alamos National Lab., NM (United States); Houston Univ., TX (United States). Dept. of Chemistry. [1994]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008096. Source: OSTI; NTIS; GPO Dep.

The author recently reported that dialkylamido complexes are promising precursors to nitride thin films. On this basis it was reasoned that transition metal and main group disilazide complexes in which the silicon has dialkylamido substituents are potential precursors to ternary silicon nitride films. Bulky disilazide ligands are known to stabilize main group and transition metal complexes with low coordination numbers. Reaction of dimethylamine with $Cl_3SiN(H)SiMe_3$ in hexane solution at 25°C gave the bulky disilazane $[(Me_2N)_3Si]N(h)SiMe_3$ (1) in 73% yield. Reaction of (1) with n-butyl lithium in benzene at 0°C produced $[(Me_2N)_3Si]N(Li)SiMe_3$ in 82% yield. $LiN[Si(NMe_2)_3]_2$ was chemically prepared in 92% yield and was converted to the amine with 83% yield. The author examined the use of amido precursors for main group oxide thin films. $Sn(NMe_2)_4$ and $Si(NMe_2)_4$ react with oxygen in an atmospheric pressure chemical vapor deposition reactor to give SnO_2 and SiO_2 films, respectively. The films were deposited on quartz, silicon, and glass at substrate temperatures of 250–400 °C. The results of the characterizations of the films and compounds are presented in this report.

12583 (LA-UR-93-3456) **Explosively produced megagauss fields and recent solid state applications.** Fowler, C.M. (Los Alamos National Lab., NM (United States)); Freeman, B.L.; Hults, W.L.; King, J.C.; Mueller, F.M.; Rickel, D.G.; Smith, J.L.; Brooks, J.S.; Goettee, J.D. Los Alamos National Lab., NM (United States). [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311109-2: Todai symposium on frontiers in high magnetic fields, Tokyo (Japan), 10-12 Nov 1993). Order Number DE94006790. Source: OSTI; NTIS; INIS; GPO Dep.

Large magnetic fields may be generated by compression of an initial magnetic flux generated over a large area at relatively low magnetic field into a region of smaller area. Following a discussion of flux compression principles, the authors discuss megagauss field systems in use at Los Alamos where chemical explosives are used to compress the flux. Their use in some solid state experiments will be discussed briefly, including a planned set of experiments on YBCO to be done jointly with a Russian team, whose aim is to determine the low temperature, critical magnetic field of YBCO.

12584 (LA-UR-94-310) **Ion-irradiation-induced densification of zirconia sol-gel thin films.** Levine, T.E. (Cornell Univ., Ithaca, NY (United States). Dept. of Materials Science and Engineering); Giannelis, E.P.; Kodali, P.; Tesmer, J.; Nastasi, M.; Mayer, J.W. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Contract DAAL03-89-K-0154. (CONF-931108-87: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006248. Source: OSTI; NTIS; GPO Dep.

We have investigated the densification behavior of sol-gel zirconia films resulting from ion irradiation. Three sets of films were implanted with neon, krypton, or xenon. The ion energies were chosen to yield approximately constant energy loss through the film and the doses were chosen to yield similar nuclear energy deposition. Ion irradiation of the sol-gel films resulted in carbon and hydrogen loss as indicated by Rutherford backscattering spectrometry and forward recoil energy spectroscopy. Although the densification was hypothesized to result from target atom displacement, the observed densification exhibits a stronger dependence on electronic energy deposition.

12585 (LA-UR-94-343) **Evidence for symmetry breaking local distortions in thallium barium copper oxide.** Nickel, J.H.; Allen, P.G.; Li, G.; Mustre de Leon, J.; Raistrick, I.D.; Conradson, S.D. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931247-9: Strongly correlated electron materials, Los Alamos, NM (United States), 15-18 Dec 1993). Order Number DE94006149. Source: OSTI; NTIS; GPO Dep.

Extended x-ray absorption fine structure (EXAFS) show local structural anomalies in $Tl_2Ba_2CuO_6$, which reduce the crystal symmetry; this symmetry lowering is interpreted as an indication of the existence of localized states. A local structural model consistent with the EXAFS results consists of a fraction of the O(1) sites displaced from the midpoint of the Cu-Cu bond, and dimpling of the CuO_2 planes when the O(1) site is not displaced from this midpoint.

12586 (ORNL/M–3155) **Ceramic Technology Project database: September 1993 summary report.** Keyes, B.L.P. Oak Ridge National Lab., TN (United States). Jan 1994. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94008494. Source: OSTI; NTIS; GPO Dep.

Data presented in this report represent an intense effort to improve processing methods, testing methods, and general mechanical properties of candidate ceramics for use in advanced heat engines. Materials discussed include GN-10, GS-44, GTE PY6, NT-154, NT-164, sintered-reaction-bonded silicon nitrides, silicon nitride combined with rare-earth oxides, NT-230, Hexoloy SX-G1, Dow Corning's β-Si_3N_4, and a few whisker-reinforced ceramic composites. Information in this report was taken from the project's semiannual and bimonthly progress reports and from final reports summarizing the results of individual studies. Test results are presented in tabular form and in graphs. All data, including test rig descriptions and material characterizations, are stored in the CTP database and are available to all project participants on request. Objective of this report is to make available the test results from these studies but not to draw conclusions from those data.

12587 (ORNL/Sub–86-SD861/01) **Engineering scale development of the Vapor-Liquid-Solid (VLS) process for the production of silicon carbide fibrils.** Hollar, W.E. Jr. (Carborundum Co., Niagara Falls, NY (United States). Technology Div.); Mills, W.H. Oak Ridge National Lab., TN (United States); Carborundum Co., Niagara Falls, NY (United States). Technology Div.; BP America, Inc., Cleveland, OH (United States). Sep 1993. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007132. Source: OSTI; NTIS; GPO Dep.

Vapor-liquid-solid (VLS)SiC fibrils are used as reinforcement in ceramic matrix composites (CMC). A program has been completed for determining process scaleup parameters and to produce material for evaluation in a CMC. The scaleup is necessary to lower production cost and increase material availability. Scaleup parameters were evaluated in a reactor with a vertical dimension twice that of the LANL reactor. Results indicate that the scaleup will be possible. Feasibility of recycling process gas was demonstrated and the impact of postprocessing on yields determined.

12588 (SAND–93-3872C) **Nucleation and growth of cubic boron nitride films produced by ion-assisted pulsed laser deposition.** Friedmann, T.A. (Sandia National Labs., Livermore, CA (United States)); Medlin, D.L.; Mirkarimi, P.B.; McCarty, K.F.; Klaus, E.J.; Boehme, D.R.; Johnsen, H.A.; Mills, M.J.; Ottesen, D.K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931108–85: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94007295. Source: OSTI; NTIS; GPO Dep.

We are studying the boron nitride system using a pulsed excimer laser to ablate from hexagonal BN (cBN) targets to form cubic BN (cBN) films. We are depositing BN films on heated (25–800C) Si (100) surfaces and are using a broad-beam ion source operated with Ar and N_2 source gases to produce BN films with a high percentage of sp^3-bonded cBN. In order to optimize growth and nucleation of cBN films, parametric studies of the growth parameters have been performed. The best films to date show >85% sp^3-bonded BN as determined from Fourier-transform infrared (FTIR) reflection spectroscopy. High resolution transmission electron microscopy (TEM) and selected area electron diffraction confirm the presence of cBN in these samples. The films are polycrystalline and show grain sizes up to 30–40 mn. We find from both the FTIR and TEM analyses that the cBN content in these films evolves with growth time. Initially, the films are deposited as hBN and the cBN nucleates on this hBN underlayer. Importantly, the position of the cBN IR phonon also changes with growth time. Initially this mode appears near 1130 cm^{-1} and the position decreases with growth time to a constant value of 1085 cm^{-1}. Since in bulk cBN this IR mode appears at 1065 cm^{-1}, a large compressive stress induced by the ion bombardment is suggested. In addition, we report on the variation in cBN percentage with temperature.

12589 (UCRL-ID–115678) **Cost-effective ceramic machining: Summary of three-body wear experiments.** Griffith, L.V. Lawrence Livermore National Lab., CA (United States). Nov 1993. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007757. Source: OSTI; NTIS; GPO Dep.

Loose-abrasive grinding experiments were conducted to compare relative grinding rates of BK7 glass, Si nitride, and alumina zirconia. Si nitride and alumina zirconia machined at about the same rate, while BK7 glass machined 6-8 times faster. Surface finish and subsurface were measured. Surface roughness of the ceramics is better than that of glass. Empirical equations for relating roughness and Preston coefficients were only qualitatively successful. Diamond and B_4C yield about the same removal rate, but this is not basis enough for recommending the cheaper abrasive for the fixed-abrasive machining process. B_4C is more friable than diamond, producing sharp cutting surfaces; however B_4C may not be a good abrasive for precision grinding. SiC produced excellent surface finish but low removal rates. Tabs, figs.

12590 (UCRL-JC–114133) **X-ray absorption study of pulsed laser deposited boron nitride films.** Chaiken, A. (Lawrence Livermore National Lab., CA (United States)); Terminello, L.J.; Wong, J.; Doll, G.L.; Sato, T. Lawrence Livermore National Lab., CA (United States). 2 Feb 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–91: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94008295. Source: OSTI; NTIS; GPO Dep.

B and N K-edge x-ray absorption spectroscopy measurements have been performed on three BN thin films grown on Si substrates using ion- assisted pulsed laser deposition. Comparison of the films' spectra to those of several single-phase BN powder standards shows that the films consist primarily of sp^2 bonds. Other features in the films's spectra suggest the presence of secondary phases, possibly cubic or rhombohedral BN. Films grown at higher deposition rates and higher ion-beam voltages are found to be more disordered, in agreement with previous work.

12591 (UCRL-JC–116378) **Conductivity measurements of ceria-based solid electrolytes using AC impedance.** Balazs, G.B.; Glass, R.S. Lawrence Livermore National Lab., CA (United States). Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940529–1: 185. Electrochemical Society meeting, San Francisco, CA (United States), 22-27 May 1994). Order Number DE94007380. Source: OSTI; NTIS; GPO Dep.

The ionic conductivities of cerium oxide samples doped separately with oxides of the entire lanthanide series (except promethium) and yttrium were measured using AC impedance. A wide variation in conductivities was observed, from 1×10^{-2} S cm^{-1} for $Ce_{0.8}Sm_{0.2}O_{1.9}$ to 2×10^{-14} S cm^{-1} for undoped ceria at 600C. Many of these ceria systems exhibited ionic conductivities higher than those of zirconia systems, making ceria a logical choice for certain low temperature applications. A correlation was found between the ionic radii of the dopant and the corresponding ionic conductivities, with ceria doped with Gd_2O_3, Sm_2O_3 and Y_2O_3 exhibiting the highest values. In addition, the relative contributions of the grain boundaries and grain interiors to the overall resistance was measured. The ceria/samaria and ceria/gadolinia systems showed a different response than the ceria/yttria system with regard to the effect of sintering time on the relative contributions.

12592 (WSRC-TR–92-557-Rev.1) **Deuterium absorption and material phase characteristics of SAES St 198 Zr-Fe Alloy: Revision 1.** Nobile, A.; Mosley, W.C.; Holder, J.S.; Brooks, K.N. Westinghouse Savannah River Co., Aiken, SC (United States). Jan

1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94008275. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports deuterium absorption and material phase characteristics of SAES St 198 Zr-Fe Alloy (76.5% Zr). Scanning electron microscope images of polished surfaces, electron probe microanalysis, and x-ray powder diffractometry indicated the presence of a primary Zr_2Fe phase with secondary phases of $ZrFe_2$, Zr_5FeSn, α-Zr, and Zr_6Fe_3O. A statistically designed experiment to determine the effects of temperature, time, and vacuum quality on activation of St 198 revealed that, when activated at low temperature (350C), deuterium absorption rate was slower when the vacuum quality was poor (2.5 Pa vs. 3×10^{-4} Pa). However, at higher activation temperature (500C), deuterium absorption rate was fast and was independent of vacuum quality. Deuterium pressure-composition-temperature (P-C-T) data are reported for St 198 in the temperature range 200 to 500C. The P-C-T data over the full range of deuterium loading and at temperatures of 350C and below is described an expression. At higher temperatures, one or more secondary reactions in the solid phase occur that slowly consume D_2 from the gas phase. X-ray diffraction and other data suggest these reactions to be: $2\ Zr_2FeD_x \rightarrow xZrD_2 + x/3\ ZrFe_2 + (2 - 2/3x)\ Zr_2Fe$ and $Zr_2FeD_x + (2 - 1/2x)\ D_2 \rightarrow 2\ ZrD_2 + Fe$, where $0 < x < 3$. Reaction between gas-phase deuterium and Zr_2Fe formed in the first reaction accounts for the observed consumption of deuterium from the gas phase by this reaction.

3606 Other Materials

Refer also to citation(s) 11479, 11482, 11666, 11742, 11777, 11786, 11825, 11948, 11949, 11950, 11951, 12407, 12480, 12550, 12587, 12589, 12667, 12683, 12691, 12695, 12736, 12758, 12940, 13304, 13860, 13890, 14083, 14125, 14131

12593 (ANL/CHM/PP–74824) **Microreflectance infrared study of electron-molecular vibrational coupling and lattice softness in BEDT-TTF salts.** Ferraro, J.R. (North Carolina State Univ., Raleigh, NC (United States). Dept. of Chemistry); Whangbo, Myung-Hwan; Wang, H.H.; Stout, P. Argonne National Lab., IL (United States); North Carolina State Univ., Raleigh, NC (United States). Dept. of Chemistry. [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; FG05-86ER45259. Order Number DE94008490. Source: OSTI; NTIS; GPO Dep.

Microreflectance infrared (MR-IR) spectra were obtained for several β- and κ-phase salts of bis(ethylenedithio)tetrathiafulvalene (BEDT-TTF or ET) and its deuterium analog d_8-ET by employing polarized and unpolarized light. The vibronic region of these MR-IR spectra provides information about the electron-molecular vibration (EMV) coupling, and the highest-frequency C-C-H bending vibration observed for an ET salt reflects the extent of its lattice softness. Under polarized light, the EMV coupling for an ET salt depends strongly upon how the light polarization vector is aligned with respect to the sample crystallographic axes. The lowest vibron frequency is indicative of increased EMV coupling.

12594 (ANL/CHM/PP–75740) **The crystallization of new synthetic organo-clays.** Carrado, K.A. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008485. Source: OSTI; NTIS; GPO Dep.

A novel method for the preparation of new synthetic, potentially catalytic clays has been discovered. In this method, a diverse variety of organic and-organometallic molecules can be directly incorporated during crystallization of the clay. This method has great potential for the incorporation of catalytically active species to create new heterogeneous catalysts. The catalyst precursors are organic-inorganic composites comprised of a layered silicate intercalated with such molecules as porphyrins or metalloporphyrins, organic aromatic dyes, a Cu(II) phthalocyanine dye, or bulky transition metal chelates. This procedure is readily applicable for introducing specific molecules for highly tailored applications, because successful templates include a variety of catalytically, electrochemically, and photochemically active species. Characterization studies were performed to establish the composition of the synthetic products, including x-ray absorption spectroscopy at NSLS.

12595 (ANL/MCT/PP–72890) **Mechanical properties of vacuum-sintered equimolar CaO-Y_2O_3 system.** Wagh, A.S. (West Indies Univ., Kingston (Jamaica)); Maiya, P.S.; Poeppel, R.B.; Russell, R.; Suratwala, T.; Roberts, D. Argonne National Lab., IL (United States). Apr 1991. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008129. Source: OSTI; NTIS; GPO Dep.

Dense composite material was fabricated aimed at pyrochemical container applications by vacuum-sintering an equimolar mixture of CaO and Y_2O_3. Its mechanical and physical properties were characterized: flexural strength, fracture toughness, thermal shock resistance, microstructure, density.

12596 (CONF-931108–83) **Ab initio study of the epitaxial growth of Ge on Si(100) surface.** Milman, V. (Oak Ridge National Lab., TN (United States)); Pennycook, S.J.; Jesson, D.E.; Payne, M.C.; Stich, I. Oak Ridge National Lab., TN (United States). Nov 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 dec 1993. Order Number DE94007245. Source: OSTI; NTIS; GPO Dep.

We identify the binding sites for adsorption of a single Ge atom on the Si(100) surface using ab initio total energy calculations. The calculated diffusion barriers are in excellent agreement with experimental estimates. Using a large supercell we resolve the controversy regarding the binding geometry and migration path for the adatom, and investigate the influence of the adatom on the buckling of Si dimers. The adatom induces a buckling defect that is frequently observed using scanning tunneling microscopy (STM); therefore the study of single adatoms may be experimentally accessible.

12597 (DOE/CE/23810–14) **Compatibility of refrigerants and lubricants with elastomers: Final report.** Hamed, G.R.; Seiple, R.H.; Taikum, Orawan. Akron Univ., OH (United States). Jan 1994. 529p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. Order Number DE94008552. Source: OSTI; NTIS; GPO Dep.

The information contained in this report is designed to assist the air-conditioning and refrigeration industry in the selection of suitable elastomeric gasket and seal materials that will prove useful in various refrigerant and refrigeration lubricant environments. In part I of the program the swell behavior in the test fluids has been determined using weight and in situ diameter measurements for the refrigerants and weight, diameter and thickness measurements for the lubricants. Weight and diameter measurements are repeated after 2 and 24 hours for samples removed fro the refrigerant test fluids and 24 hours after removal from the lubricants. Part II of the testing program includes the evaluation of tensile strength, hardness, weight, and dimensional changes after immersion aging in refrigerant/lubricant mixtures of selected elastomer formulations at elevated temperature and pressure.

12598 (DOE/CE/23810–33C) **Measurement of viscosity, density, and gas solubility of refrigerant blends in selected synthetic lubricants: Quarterly report, October 1–December 30, 1993.** Cavestri, R.C. Imagination Resources, Inc., Dublin, OH (United States). Jan 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. Project 650-51400. Order Number DE94007723. Source: OSTI; NTIS; GPO Dep.

Liquid/liquid miscibilities of four different 32 ISO VG polyolesters and one alkylbenzene at three concentrations have been determined with five refrigerant blends, including HC-290. A vapor lubricant equilibrium (VLE) viscosity reduction of 32 ISO VG mineral oil with HCFC-22 has been completed. Composite viscosity reduction information by the fractionate components from R-502 in 32 ISO VG mineral oil has been obtained from −10°C (14°F) to 125°C (257°F) isotherms. Vapor lubricant equilibrium (VLE) viscosity reduction for 32 ISO VG mixed acid polyolester with HFC-134a and HFC-143a has also been completed. Data is also presented

for the viscosity reduction of 32 ISO VG branched acid polyolester by these same refrigerants.

12599 (DOE/ER/14304–1) **Degenerate four-wave mixing as a diagnostic of plasma chemistry: Progress report, September 15, 1992–March 15, 1993.** Zare, R.N. Stanford Univ., CA (United States). Dept. of Chemistry. Mar 1993. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-92ER14304. Order Number DE94008588. Source: OSTI; NTIS; GPO Dep.

Degenerate four-wave mixing (DFWM) has been found suitable for in situ monitoring during plasma-enhanced chemical vapor deposition. DFWM has been used to monitor CH and C_2 during synthesis of diamond thin films. Analysis of CH rotational and vibrational spectra confirmed the temperature trend predicted by the 1-D model. For substrate temperature 1200 K and free-stream temperatures of 3500 and 4300 K, the 1-D simulations predicted boundary layer thicknesses consistent with observations. The species concentration change across the boundary layer is dramatic; at 2 mm from the surface, both CH and C_2 reach maximum concentration. It has been demonstrated that, using a conventional laser system, operating at visible wavelengths (low energies), DFWM is nonintrusive and can generate signals that are easily monitored.

12600 (EGG-SCM–10804) **Inorganic polymer engineering materials.** Stone, M.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1993. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94008519. Source: OSTI; NTIS; GPO Dep.

Phosphazene-based, inorganic-polymer composites have been produced and evaluated as potential engineering materials. The thermal, chemical, and mechanical properties of several different composites made from one polymer formulation have been measured. Measured properties are very good, and the composites show excellent promise for structural applications in harsh environments. Chopped fiberglass, mineral, cellulose, and woodflour filled composites were tested. Chopped fiberglass filled composites showed the best overall properties. The phosphazene composites are very hard and rigid. They have low dielectric constants and typical linear thermal expansion coefficients for polymers. In most cases, the phosphazene materials performed as well or better than analogous, commercially available, filled phenolic composites. After 3 to 5 weeks of exposure, both the phosphazene and phenolics were degraded to aqueous bases and acids. The glass filled phosphazene samples were least affected.

12601 (ENEA-RT-INN–92-40) **Contributions to CNR-International Workshop on laser deposition of advanced materials.** ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Feb 1993. 28p. (CONF-9209307–Exc.: International workshop on laser deposition of advanced materials, Tito (Italy), 28-30 Sep 1992). Order Number DE94716511. Source: OSTI; NTIS (US Sales Only).

Three papers are included: CARS monitoring of u.v. laser induced grafitization of benzene, ArF laser deposited tin oxide films studied by "in situ" surface analysis techniques, and gas and adsorbed phase photochemistry of tetramethyltin probed by optical diagnostics. They are processed separately for the data base.

12602 (ETDE-IT–94-11) **Physical properties of P and B doped microcrystalline Si:H deposited by PECVD.** Rubino, A. (ENEA, Portici (Italy). Centro Ricerche Fotovoltaiche); Addonizio, M.L.; Conte, G.; Nobile, G.; Terzini, E.; Madan, A. No corporate text available. 1993. 6p. (CONF-9304235–2: Amorphous silicon technology, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94752512. Source: OSTI; NTIS (US Sales Only).

Boron and phosphorus doped high conductivity microcrystalline thin films were deposited in a PECVD reactor. This paper reports conductivities as high as 3 and 41 S/cm for B and P doped materials respectively on films deposited at 210 degrees C. The conductivity, as well as, the microcrystalline fraction increase for the n layer with decreasing RF power, while, for the p material, an increase of power is needed to improve the film characteristics. The conductivity prefactor, as well as, the conductivity itself as a function of the activation energy show a slope inversion for both n and p materials at an activation energy of about 40 meV and 80 meV respectively. Different possible transport mechanisms are examined in order to explain the experimental data.

12603 (ETDE-IT–94-16) **Correlation between minority carrier diffusion length and microstructure in a-Si:H thin films.** Conte, G. (ENEA, Portici (Italy). Centro Ricerche Fotovoltaiche); Fameli, G.; Nobile, G.; Rubino, A.; Terzini, E.; Villani, F.; Caputo, D.; De Cesare, G.; Irrera, F.; Palma, F. No corporate text available. 1993. 6p. (CONF-9304235–1: Amorphous silicon technology, San Francisco, CA (United States), 12-16 Apr 1993). Order Number DE94752517. Source: OSTI; NTIS (US Sales Only).

The aim of this work is to investigate the opto-electronic properties of amorphous hydrogenated silicon (a-Si:H). The deposition temperature was used as a driving force to modify the morphology and bonded hydrogen distribution. The influence of the hydrogen microstructure on the carrier m-t products was examined. The m-t products, for both carriers, were evaluated from the diffusion length measurement, by using the Steady State Photocarrier Grating (SSPG) technique, and from the photoconductivity in the steady state condition (SSPC). The m-t products were correlated with the defect density and Fermi level position. The effects of the defect density on the Fermi level position were examined within the framework of a defect pool model in order to justify the consistency of the results.

12604 (INIS-JP–018, pp. 491-498) **Behaviour of elastomeric seals at low temperature.** Weise, H.P. (Bundesanstalt fuer Materialforschung und -pruefung, Berlin (Germany)); Kowalewsky, H.; Wenz, R. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The properties of elastomer O-ring seals (Viton, silicone rubber, EPDM) at low temperature have been investigated by measuring the gas leakage rate and the sealing force during thermal cycling between +20degC and -70degC. For all materials it has been found that at a well defined (critical) temperature the leakage rate sharply rises from permeation level to a high value which is determined by gas streaming through the leak path between the O-ring and the flange surfaces arising from thermal contraction of the elastomer in the glassy state. At the critical temperature the sealing force has been found to be zero or even negative due to adhesion between the elastomer material and the flanges. For all seals the critical temperature is well below the glass transition of the elastomer and also significantly below the temperature where the compression set becomes 100 %. Warming up the sealing system restores leak tightness. Low temperature cycle of elastomeric seals have been found to be entirely reversible. (author).

12605 (INIS-mf–13749, pp. 19-20) **The features of production of In As_{1-x} Sb_x P_z-Ga_{1-Y} Al_Y Sb_{1-n} As_n hetero lasers by the liquid-phase epitaxy method.** Abdullaev, G.B. (Academy of Sciences, Baku (Azerbaijan). Inst. of Physics of the Azerbaijan); Mursakulov, N.N.; Suleimanov, Z.I. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALUMINIUM ARSENIDES/epitaxy; GALLIUM ARSENIDES/epitaxy; INDIUM ANTIMONIDES/epitaxy; INDIUM ARSENIDES/epitaxy; PHOSPHORUS COMPOUNDS/epitaxy; EPITAXY; COHERENT RADIATION; CRYSTAL GROWTH; ELECTRICAL PROPERTIES; ELECTROLUMINESCENCE; LASERS; LAYERS; P-N JUNCTIONS; SUBSTRATES

12606 (INIS-mf–13749, pp. 73-74) **Surface modification of EPR as biomaterial by laser induced graft copolymerization of HEMA and NVP.** Mirzadeh, H. (Polymer Reseach Center of Iran, Tehran (Iran, Islamic Republic of)); Khorasani, M.T.; Katbab, A.A.; Burford, R.P. Atomic Energy Organization of Iran, Teheran (Iran,

Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 28-29.

Short communication. ACRYLATES/copolymerization; ETHYLENE PROPYLENE DIENE POLYMERS/laser radiation; PVP/copolymerization; ACRYLATES; COPOLYMERIZATION; BENZOPHENONE; EXCITATION; GRAFTS; PVP; RUBBERS; SURFACE PROPERTIES; VULCANIZATION

12607 (INIS-mf–13749, pp. 87) **Stability assessment of hydrocarbon and crude oil emulsions by laser method.** Vaziri, A. (London Univ., (United Kingdom) School of Pharmacy). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PETROLEUM/laser radiation; PETROLEUM/stability; EMULSIONS; HYDROCARBONS; PETROLEUM; STABILITY

12608 (INIS-mf–13749, pp. 106) **Laser and polymer physics.** Mohammadi, N. (Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemical Engineering). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 45.

Short communication. LASER RADIATION/polymers; COATINGS; CRYSTALLIZATION; FRACTURE MECHANICS; POLYMERS; LATEX

12609 (INIS-mf–14185) **Novel ODS alloys for plant components subject to hot-gas impacts: Final report.** Lempenauer, K.; Arzt, E. Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany). Inst. fuer Werkstoffwissenschaften. Feb 1991. 74p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03M0013A. Order Number DE94752191. Source: OSTI; NTIS (US Sales Only); INIS.

Within the framework of the cooperative research project, novel surface layer systems have been developed for ODS, nickel-base alloys with an aluminium content of 10-12 weight %, intended for use at service temperatures between 1050 and 1100 C. They exhibit a good resistance to oxidation at high temperatures and low corrosion rates under conditions of sulfate-induced attack. The well-known chemical compatibility problems occurring at high service temperatures could be solved by an adequate variation of the activity gradients of important alloying constituents in the base material and the protective layer. Aluminium oxide layers prepared by pin-pointed pre-oxidation serve as diffusion-limiting layers between the base material and the oxidation-resistant surface layers and achieve a considerable reduction in interdiffusion processes between the surface layer and the base material. (orig.)

12610 (INIS-RU–370, pp. 40-45) **Influence of He^+ ion implantation on hydrogen retention in graphites types USB-15 and MPG-8.** Guseva, M.I.; Gorbatov, E.A.; Gureev, V.M.; Stolyarova, V.G.; Belyanin, O.P.; Chernov, I.P.; Shadrin, V.N. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The investigations of preliminary and simultaneous helium and hydrogen ion bombardmemt influence on the behaviour of hydrogen implanted at various temperature into the samples of USB-15 and MPG-8 graphites were carried out. The method of recoil nuclei was used to study the implanted layers. The synergetic effect of simultaneius irradiation by H^+ and He^+ ions on the hydrogen and helium atoms distribution profiles and the integral hydrogen concentration in the analysed layers was revealed. 10 refs.; 7 figs.

12611 (Juel–2738) **Ion beam synthesis of monocrystalline $CoSi_2$ layers in Si and their electrical and structural characterization.** Jebasinski, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Schicht- und Ionentechnik; Koeln Univ. (Germany). Mar 1993. 130p. (In German). Order Number DE94747625. Source: OSTI; NTIS (US Sales Only).

It was shown that $CoSi_2$ films can be produced by means of ion beam synthesis over a wide thickness range (12-140 nm), by variation of the implantation energy and dose, with a very good film quality in Si and still satisfactory quality in SIMOX wafers and SiGe films. The resulting film structures cannot be produced by conventional means but are very important for applications in modules. For example, it was possible for the first time to produce very thin $CoSi_2$ layers (<30 nm) in (100) Si and (100) $Si/CoSi_2/SiO_2$- and $SiGe/CoSi_2/SiGe$-heterostructures. (orig./MM)

12612 (Juel–2747) **Corrosion of graphitic high temperature reactor materials in steam/helium mixtures at total pessures of 3-55 bar and temperatures of 900-1150 C (1173-1423K): Comprehensive report of Institute of Nuclear Safety Research (ISF) now Institute of Safety Research and Reactor Technology (ISR) experimental work.** Hinssen, H.K.; Loenissen, K.J.; Katscher, W.; Moormann, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik. Mar 1993. 107p. (In German). Order Number DE94752461. Source: OSTI; NTIS (US Sales Only); INIS.

In course of accident examination for (HTR), experiments on the corrosion behavior of graphitic reactor materials in steam have been performed a total pressures of 3-55bar and temperatures of 900-1150 C (1173-1423K); these experiments and their evaluation are documented here. Reactor materials examined are the structure graphite V483T2 and the fuel element matrices A3-27 and A3-3. In all experiments, the steam partial pressure was 474mbar (inert gas helium). The dependence of reaction rates and density profiles on burn-off, total pressure and temperature has been examined. Experimental reaction rates depending on burn-off are fitted by theoretical curves, a procedure, which allows rate comparison for a well defined burn-off. Comparing rates as a function of total pressure, V483T2 shows a linear dependence on $1\sqrt{p_{total}}$, whereas for matrix materials a pressure independent rate was found for p_{total}<15bar. The temperature dependence of rates (in-pore diffusion controlled regime) is characterized by activation energies of 246kJ/mol(V483T2) resp. 185kJ/mol (matrix materials). For corroded specimens, density profiles have been measured in order to obtain some information about depth of material damage. In detail depth of penetrations of corrosive attack are 0.2-2.5 mm for V483T2, 1.1-2.8mm for A3-27 and 1.5- >4mm for A3-3. (orig.)

12613 (LA–12755-MS) **SESAME equation of state for epoxy.** Boettger, J.C. Los Alamos National Lab., NM (United States). Mar 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007728. Source: OSTI; NTIS; GPO Dep.

A new SESAME equation of state (EOS) for epoxy has been generated using the computer program GRIZZLY. This new EOS has been added to the SESAME EOS library as material number 7603.

12614 (LBL–34881) **Double rotation NMR studies of zeolites and aluminophosphate molecular sieves.** Jelinek, R. (California Univ., Berkeley, CA (United States). Dept. of Chemistry). Lawrence Berkeley Lab., CA (United States). Jul 1993. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007032. Source: OSTI; NTIS; GPO Dep.

Goal is to study the organization and structures of guest atoms and molecules and their reactions on internal surfaces within pores

of zeolites and aluminophosphate molecular sieves. ^{27}Al and ^{23}Na double rotation NMR (DOR) is used since it removes the anisotropic broadening in NMR spectra of quadrupolar nuclei, thus increasing resolution. This work concentrates on probing aluminum framework atoms in aluminophosphate molecular sieves and sodium extra framework cations in porous aluminosilicates. In aluminophosphates, ordering and electronic environments of the framework ^{27}Al nuclei are modified upon adsorption of water molecules within the channels; a relation is sought between the sieve channel topology and the organization of adsorbed water, as well as the interaction between the Al nuclei and the water molecules. Extra framework Na^+ cations are directly involved in adsorption processes and reactions in zeolite cavities.

12615 Method and apparatus for production of graded ceramic-metal microstructures. Rabin, B.H. To Dept. of Energy. 1992. U.S. patent application 7-820,462. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94007359. Source: OSTI; NTIS; GPO Dep.

A method and apparatus that produces a graded microcomposite is disclosed that controls the residual stresses developed at dissimilar material interfaces due to differences in material properties. The feasibility of fabricating graded Al_2O_3-metal materials by two techniques, physical vapor deposition and powder metallurgy, is demonstrated. Results from microstructural characterization of these materials are presented.

12616 Anisotropic fiber alignment in composite structures. Graham, A.L.; Mondy, L.A.; Guell, D.C. To Dept. of Energy. 1992. U.S. patent application 7-832,156. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007351. Source: OSTI; NTIS; GPO Dep.

High strength material composite structures are formed with oriented fibers to provide controlled anisotropic fibers. Fibers suspended in non-dilute concentrations (e.g., up to 20 volume percent for fibers having an aspect ratio of 20) in a selected medium are oriented by moving an axially spaced array of elements in the direction of desired fiber alignment. The array elements are generally perpendicular to the desired orientation. The suspension medium may also include sphere-like particles where the resulting material is a ceramic.

12617 Organic or organometallic template mediated clay synthesis. Gregar, K.C.; Winans, R.E.; Botto, R.E. To Dept. of Energy. 1992. U.S. patent application 7-836,747. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007347. Source: OSTI; NTIS; GPO Dep.

A method is given for incorporating diverse varieties of intercalants or templates directly during hydrothermal synthesis of clays such as hectorite or montmorillonite-type layer-silicate clays. For a hectorite layer-silicate clay, refluxing a gel of silica sol, magnesium hydroxide sol and LiF for 2 days with an organic or organometallic intercalant or template results in crystalline products containing either (a) organic dye molecules such as ethyl violet and methyl green, (b) dye molecules such as alcian blue based on a Cu(II)-phthalocyannine complex, or (c) transition metal complexes such as Ru(II)phenanthroline and Co(III)sepulchrate or (d) water-soluble porphyrins and metalloporphyrins. Montmorillonite-type clays are made by the method taught by US patent No. 3,887,454 issued to Hickson, June 13, 1975; however, a variety of intercalants or templates may be introduced. The intercalants or templates should have water-solubility, positive charge, and thermal stability under moderately basic (pH 9-10) aqueous reflux conditions or hydrothermal pressurized conditions for the montmorillonite-type clays.

12618 Glass melter off-gas system. Jantzen, C.M. To Dept. of Energy. 1992. U.S. patent application 7-841,170. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007340. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus and method for melting glass in a glass melter in such a way as to reduce deposition of particulates in the off-gas duct. Deposit accumulation is reduced by achieving an off-gas velocity above approximately 15 meters/second and an off-gas temperature as close as possible to, but not higher than, the glass softening point. Because the deposits are largely water-soluble, those that do form on the interior surface of the duct can be readily removed by injecting water or steam directly into the off-gas duct from its entrance or exit.

12619 (PNL-SA-22718) **Ion-beam-driven amorphization of $Ca_2La_8(SiO_4)_6O_2$ single crystals.** Weber, W.J. (Pacific Northwest Lab., Richland, WA (United States)); Hess, N.J.; Wang, L.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-931108–67: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006219. Source: OSTI; NTIS; INIS; GPO Dep.

Single crystals of $Ca_2La_8(SiO_4)_6O_2$, with 1% Nd substituted for La, were irradiated with 0.8 MeV Ne^+ and 1.5 MeV Kr_+ ions from 15 to 773 K. The irradiations were carried out using the HVEM-Tandem Facility at Argonne National Laboratory. The structural changes and the ion fluence for complete amorphization were determined by in situ transmission electron microscopy. The ion fluence for complete amorphization increased with temperature in two stages associated with defect annealing processes. The critical temperature for amorphization increased from ~360 K for 0.8 MeV Ne^+ to ~710 K for 1.5 MeV Kr^+. During in situ annealing studies, irradiation-enhanced recrystallization was observed at 923 K. Spatially-resolved fluorescence spectra of the Nd ion excited with 488.0 mn laser excitation showed marked line-broadening toward the center of the amorphous regions. Initial measurements indicate the subtle shifts of the $^9I_{9/2}$ groundstate energy levels can be measured by pumping directly into the excited state $^4F_{3/2}$ manifold suggesting that the line broadening observed originates from a distribution of geometrically distorted Nd sites.

12620 (SAND–93-1545C) **Characterization of thermally stable dye-doped polyimide based electrooptic materials.** Meinhardt, M.B. (Sandia National Labs., Albuquerque, NM (United States)); Cahill, P.A.; Seager, C.H.; Beuhler, A.J.; Wargowski, D.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931108–78: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94005309. Source: OSTI; NTIS; GPO Dep.

Polymeric electrooptic materials have the potential to replace electronic switches in applications which require minimization of heat dissipation while maintaining high switching speeds. Polyimide matrices incorporating electrooptic dyes are promising materials for such applications due to their low cost and compatibility with existing processing environments. Preparation and characterization of novel dye-doped polyimide films for electrooptics is described. Thermal stabilities of donor-acceptor 2,5-diaryl oxazoles were evaluated by differential scanning calorimetry. Absorptive losses in thin films of Ultradel 9000D® doped with donor-acceptor oxazoles were measured by photothermal deflection spectroscopy. Absorptive losses at high doping levels may be explainable by dye-dye aggregation or dye degradation during the curing process. Lower doping levels, however, show losses of $\leq$ 3.0 dB/cm at 830 nm and $\leq$ 2.4 dB/cm at 1,320 nm.

12621 (SAND–93-2474C) **Multiple size scale structures in silica/siloxane composites studied by small-angle scattering.** Beaucage, G.; Schaefer, D.W.; Ulibarri, T.; Black, E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940301–19: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94007300. Source: OSTI; NTIS; GPO Dep.

The physical properties of in-situ produced composites, such as the TEOS-polysiloxane based systems, are directly related to the complex interaction of structural features from the nano- to macroscopic scales. The nature of these structural interactions are a key element in understanding and controlling mechanical properties in these systems. We believe that the smallest scale structures, in the

nanometer range, correlate with properties such as the modulus while large-scale structures on the micron scale effect failure in these materials. This paper discusses techniques for analysis of structural features and interrelation of structural features over these wide ranges of size using small-angle light, x-ray and neutron scattering. Combination of data from different instruments allows for characterization of the interaction between these different size scale features.

12622 (SAND–94-8219) **Compilation of diamond-like carbon properties for barriers and hard coatings.** Outka, D.A. (Sandia National Labs., Livermore, CA (United States)); Hsu, Wen L.; Boehme, D.R.; Yang, N.Y.C.; Ottesen, D.K.; Johnsen, H.A.; Clift, W.M.; Headley, T.J. Sandia National Labs., Livermore, CA (United States). Feb 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94008231. Source: OSTI; NTIS; GPO Dep.

Diamond-like carbon (DLC) is an amorphous form of carbon which resembles diamond in its hardness, lubricity, and interest for hardness, lubricity, and resistance to chemical attack. Such properties make DLC of use in barrier and hard coating technology. This report examines a variety of properties of DLC coatings which are relevant to its use as a protective coating. This includes examining substrates on which DLC coatings can be deposited; the resistance of DLC coatings to various chemical agents; adhesion of DLC coatings; and characterization of DLC coatings by electron microscopy, FTIR, sputter depth profiling, stress measurements, and nanoindentation.

12623 (SLAC–427) **Anisotropic phase separation through the metal-insulator transition in amorphous Mo-Ge and Fe-Ge alloys.** Regan, M.J. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Stanford Univ., CA (United States). Stanford Synchrotron Radiation Lab. Dec 1993. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0061). Order Number DE94007259. Source: OSTI; NTIS; INIS; GPO Dep.

Since an amorphous solid is often defined as that which lacks long-range order, the atomic structure is typically characterized in terms of the high-degree of short-range order. Most descriptions of vapor-deposited amorphous alloys focus on characterizing this order, while assuming that the material is chemically homogeneous beyond a few near neighbors. By coupling traditional small-angle x-ray scattering which probes spatial variations of the electron density with anomalous dispersion which creates a species-specific contrast, one can discern cracks and voids from chemical inhomogeneity. In particular, one finds that the chemical inhomogeneities which have been previously reported in amorphous Fe_xGe_{1-x} and Mo_xGe_{1-x} are quite anisotropic, depending significantly on the direction of film growth. With the addition of small amounts of metal atoms ($x<0.2$), no films appear isotropic nor homogeneous through the metal/insulator transition. The results indicate that fluctuations in the growth direction play a pivotal role in preventing simple growth models of a columnar structure or one that evolves systematically as it grows. The anomalous scattering measurements identify the metal atoms (Fe or Mo) as the source of the anisotropy, with the Ge atoms distributed homogeneously. The author has developed a method for using these measurements to determine the compositions of the phase-separating species. The results indicate phase separation into an amorphous Ge and an intermetallic phase of stoichiometry close to $FeGe_2$ or $MoGe_3$. Finally, by manipulating the deposited power flux and rates of growth, Fe_xGe_{1-x} films which have the same Fe composition x can be grown to different states of phase separation. These results may help explain the difficulty workers have had in isolating the metal/insulator transition for these and other vapor-deposited amorphous alloys.

12624 (SLAC–434) **Anomalous small angle x-ray scattering studies of amorphous metal-germanium alloys.** Rice, M. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Stanford Univ., CA (United States). Stanford Synchrotron Radiation Lab. Dec 1993. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0065). Order Number DE94007258. Source: OSTI; NTIS; GPO Dep.

This dissertation addresses the issue of composition modulation in sputtered amorphous metal-germanium thin films with the aim of understanding the intermediate range structure of these films as a function of composition. The investigative tool used in this work is anomalous small-angle X-ray scattering (ASAXS). The primary focus of this investigation is the amorphous iron-germanium ($a\text{-}Fe_xGe_{100-x}$) system with particular emphasis on the semiconductor-rich regime. Brief excursions are made into the amorphous tungsten-germanium ($a\text{-}W_xGe_{100-x}$) and the amorphous molybdenum-germanium ($a\text{-}Mo_xGe_{100-x}$) systems. All three systems exhibit an amorphous structure over a broad composition range extending from pure amorphous germanium to approximately 70 atomic percent metal when prepared as sputtered films. Across this composition range the structures change from the open, covalently bonded, tetrahedral network of pure a-Ge to densely packed metals. The structural changes are accompanied by a semiconductor-metal transition in all three systems as well as a ferromagnetic transition in the $a\text{-}Fe_xGe_{100-x}$ system and a superconducting transition in the $a\text{-}Mo_xGe_{100-x}$ system. A long standing question, particularly in the $a\text{-}Fe_xGe_{100-x}$ and the $a\text{-}Mo_xGe_{100-x}$ systems, has been whether the structural changes (and therefore the accompanying electrical and magnetic transitions) are accomplished by homogeneous alloy formation or phase separation. The application of ASAXS to this problem proves unambiguously that fine scale composition modulations, as distinct from the simple density fluctuations that arise from cracks and voids, are present in the $a\text{-}Fe_xGe_{100-x}$, $a\text{-}W_xGe_{100-x}$, and $a\text{-}Mo_xGe_{100-x}$ systems in the semiconductor-metal transition region. Furthermore, ASAXS shows that germanium is distributed uniformly throughout each sample in the $x<25$ regime of all three systems.

12625 (UCRL-JC–107581) **Laminated metal composites of ultrahigh carbon steel/brass and Al/Al-SiC: Processing and properties.** Syn, C.K. (Lawrence Livermore National Lab., CA (United States)); Lesuer, D.R.; Cadwell, K.L.; Sherby, O.D.; Brown, K.R. Lawrence Livermore National Lab., CA (United States). Oct 1991. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-920305–5-Rev.1: Minerals, Metals, and Materials Society (TMS) annual meeting and exhibition, San Diego, CA (United States), 1-5 Mar 1992). Order Number DE94007869. Source: OSTI; NTIS; GPO Dep.

We have fabricated laminated metal composites of (i) ultrahigh carbon steel (1.8%C) and brass (70Cu-30Zn), and (ii) aluminum 5182 and aluminum 6061 with 25 vol.% SiC_p. The laminates were prepared by hot pressing alternating layers of the component materials in an argon gas atmosphere. The steel was thermomechanically processed to produce a fine grained microstructure that exhibited superplasticity. The brass and aluminum materials were obtained from commercial sources and used in the as-received condition. Laminates with different numbers of layers and layer thickness were made. The compressive stress and strain rate were measured during hot pressing, and material flow behavior in the UHCS-brass laminate was found to be rate-controlled by the stronger component rather than by the softer one (brass). Material flow behavior was more complicated in the Al-laminate. Tensile and behavior were determined by tensile tests and by chevron notched fracture toughness tests. Details of processing, microstructure and initial results of mechanical property tests of these laminates are discussed.

12626 (UCRL-JC–113493) **The role of defects in laser damage of multilayer coatings.** Kozlowski, M.R.; Chow, R. Lawrence Livermore National Lab., CA (United States). 21 Dec 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931054–7: 25. Boulder damage symposium: annual symposium on optical materials for high-power lasers, Boulder, CO (United States), 27-29 Oct 1993). Order Number DE94006731. Source: OSTI; NTIS; INIS; GPO Dep.

Laser induced damage to optical coatings is generally a localized phenomenon associated with coating defects. The most common of the defect types are the well-known nodule defect. This paper reviews the use of experiments and modeling to understand the formation of these defects and their interaction with laser light. Of particular interest are efforts to identify which defects are most susceptible to laser damage. Also discussed are possible methods for

stabilizing these defects (laser conditioning) or preventing their initiation (source stabilization, spatter particle trapping).

12627 (UCRL-JC–113900) **Amorphous/crystalline structure and phase transformations in metastable semiconducting $Ge_{1-x}Sn_x$.** Lee, S.M. (Lawrence Livermore National Lab., CA (United States)); Barmak, K. Lawrence Livermore National Lab., CA (United States). Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–79: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006659. Source: OSTI; NTIS; GPO Dep.

The semiconducting crystalline alloys, $Ge_{1-x}Sn_x$, are of interest due to theoretical predictions about their electronic band structures which make them useful in infrared photodetectors. However the composition region where these alloys have the desired properties is greater than the equilibrium solid solubility limit of Sn in Ge ($x \leq 0.01$). The authors have circumvented the solubility limits and produced thin (2,000 Å) and thick (4–8 μm) films of $Ge_{1-x}Sn_x$ ($x \leq 0.31$) by rf sputtering. Differential scanning calorimetry (DSC) measurements were performed to study grain growth and crystallization processes in these highly metastable semiconductors. X-ray and electron diffraction measurements indicated the materials were amorphous, but the fact that some of the films were fine grained polycrystalline samples only became apparent in their DSC spectra. The authors present models that describe quantitatively the transformation behavior in both sets of films.

12628 (UCRL-JC–114787) **Structure-property relationships of carbon aerogels.** Pekala, R.W.; Alviso, C.T.; Kong, F.M. Lawrence Livermore National Lab., CA (United States). Dec 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931255–1: 3. pacific polymer conference, Gold Coast (Australia), 13-17 Dec 1993). Order Number DE94007120. Source: OSTI; NTIS; GPO Dep.

Of the organic reactions in sol-gel polymerizations, the most studied reaction is the aqueous polycondensation of resorcinol with formaldehyde; the resulting crosslinked gels are supercritically dried from CO_2 to give resorcinol-formaldehyde (RF) aerogels. These aerogels can be pyrolyzed to form vitreous carbon monoliths with black color, high porosity, ultrafine cell/pore size, high surface area, and interconnected particles of the organic precursor. The structure and properties of the carbon aerogels depend on R/C (resorcinol/catalyst) ratio of starting solution, pyrolysis temperature, and chemical activation. Each variable is discussed. Carbon aerogels provide an almost ideal electrode material (in double-layer capacitors) owing to low electrical resistivity (<40 mohm-cm), controllable pore size distribution (5–500 Å), and high volumetric surface areas (~500 m^2/cm^3).

12629 (UCRL-JC–115246) **Electrical resistance tomography of concrete structures.** Daily, W. (Lawrence Livermore National Lab., CA (United States)); Ramirez, A.; Binley, A.; Henry-Poulter, S. Lawrence Livermore National Lab., CA (United States). Oct 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940342–1: ECAPT '94: 3rd European concerted action meeting on process tomography, Lisbon (Portugal), 24-27 Mar 1994). Order Number DE94002990. Source: OSTI; NTIS; GPO Dep.

The purpose of this work is to determine the feasibility of using Electrical resistance tomography (ERT) to nondestructively examine the interior of concrete structures such as bridge pillars and roadways. We report the results of experiments wherein ERT is used to image the two concrete specimens in the laboratory. Each specimen is 5 inches square and 12 inches long and contained steel reinforcing rods along its length. Twenty electrodes were placed on each sample and an-image of electrical resistivity distribution was generated from current and voltage measurements. We found that the images show the general location of the reinforcing steel and, what's more important, delineate the absence of the steel. The method may therefore be useful for determining if such steel has been destroyed by corrosion, however to make it useful, the technique must have better resolution so that individual reinforcing steel units are resolved.

12630 (UCRL-JC–115698) **Influence of volume fraction of component materials and interlayer bond strength on fracture toughness of multi-layer Al 6090-25 vol % SiCp and Al 5182 laminates.** Syn, C.K. (Lawrence Livermore National Lab., CA (United States)); Stoner, S.; Lesuer, D.R.; Sherby, O.D. Lawrence Livermore National Lab., CA (United States). Nov 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940204–5: 94. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE94007141. Source: OSTI; NTIS; GPO Dep.

Multilayer laminates of Al 6090/SiC/25p MMC and Al 5182 were prepared by hot pressing alternating layers of the component materials at 450°C in an argon gas atmosphere. Tensile properties, interlayer normal and shear bond strengths, and fracture toughness were measured in the T6-treated and untreated conditions. Fracture toughness was also measured as a function of the volume fraction of the MMC component. Yield and tensile strengths increased substantially by the T6 treatment while the total-elongation and interlayer bond strengths decreased even more substantially. Fracture toughness, on the other hand, did not change appreciably by the T6 treatment. The fracture toughness increased perceptibly with an increase in the volume percent of the MMC component.

12631 (UCRL-JC–115796) **Cement minerals at elevated temperature: Thermodynamic and structural characteristics.** Bruton, C.J.; Phillips, B.L.; Meike, A.; Martin, S.; Viani, B.E. Lawrence Livermore National Lab., CA (United States). Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States);Atomic Energy of Canada Ltd., Ottawa, ON (Canada). DOE Contract W-7405-ENG-48. (CONF-931108–82: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006724. Source: OSTI; NTIS; INIS; GPO Dep.

Large quantities of cementitious materials may be used in the construction of a potential nuclear waste repository. Temperatures in the emplacement drifts may reach over 200 C owing to decay heat from radioactive waste for various "extended-dry" repository scenarios. Despite its potential significance, the mineralogic response of cement to elevated temperature is not well known. The chemistry of fluid introduced to the repository from cementitious materials can also have a significant impact on repository performance. The masses of water associated with the use of cementitious materials such as shotcrete, which includes both structural and pore water, can be sizable. Pore water may be driven out by heating, and structural water may be released through phase dehydration. An experimental and modeling program has been designed to elucidate the structural and thermodynamic response of cement minerals to elevated temperature. The components of the program include: (a) synthesis of hydrated Ca-silicates; (b) structural analysis of cement phases during heating and dehydration/rehydration; (c) mechanistic and thermodynamic descriptions of the hydration/dehydration behavior of hydrated Ca-silicates as a function of temperature, pressure and relative humidity; (d) study of naturally occurring hydrated Ca-silicates; and (e) measurements of thermodynamic data for hydrated Ca-silicates.

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12632 (PNL–8999) **Molecular Science Research Center 1992 annual report.** Knotek, M.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007464. Source: OSTI; NTIS; GPO Dep.

The Molecular Science Research Center is a designated national user facility, available to scientists from universities, industry, and other national laboratories. After an opening section, which includes conferences hosted, appointments, and projects, this document presents progress in the following fields: chemical structure and dynamics; environmental dynamics and simulation; macromolecular structure and dynamics; materials and interfaces; theory, modeling, and simulation; and computing and information sciences. Appendices are included: MSRC staff and associates, 1992 publications and presentations, activities, and acronyms and abbreviations.

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Refer also to citation(s) 11450, 11484, 11486, 11628, 11657, 11709, 11733, 11736, 11845, 11850, 12227, 12566, 12621, 12674, 12679, 12686, 12779, 12962, 12974, 12982, 13112, 13116, 13129, 13149, 13165, 13319, 13898, 13921, 14276

12633 (ANL/CHM/PP–75638) **Improved maceral separation method using a continuous flow centrifuge.** Dyrkacz, G.R.; Bloomquist, C.A.A. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008136. Source: OSTI; NTIS; GPO Dep.

A new procedure was developed to provide gram to kilogram amounts of highly enriched coal macerals using continuous flow centrifuges. Ninefold enrichments were routinely obtained for various macerals. In addition to the development of a practical technique for large bench-top maceral separations, this work, funded by the DOE Division of Chemical Sciences, has enabled a richer insight into the dynamics of continuous flow centrifuges. At the same time, Dr. Gary R. Dyrkacz and Carol A. A. Bloomquist, using density gradient centrifugation to monitor the continuous flow separations have been able to develop a general separation model for maceral separations.

12634 (ANL/CHM/PP–77676) **Liquefaction behavior of separated coal macerals.** Joseph, J.T. (Amoco Research Center, Naperville, IL (United States)); Fisher, R.B.; Masin, C.A.; Winans, R.E.; Dyrkacz, G.R.; Hunt, J.E.; Bloomquist, C.A.A. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008139. Source: OSTI; NTIS; GPO Dep.

In a joint program, groups at Amoco Oil and Argonne National Laboratory have elucidated the behavior of very pure coal macerals under liquefaction conditions. Macerals are microscopic distinct components of the organic matter in coals that differ in their chemical and physical properties. A new method, continuous flow density gradient centrifugation, was used to separate an Argonne Premium Coal Sample into its three main maceral groups, vitrinite, which is derived from wood, liptinites, which are derived from a number of plant sources rich in hydrogen arid, finally, inertinites, which are in part fossil charcoal. In the liquefaction studies, each pure maceral was heated with a hydrogen-rich solvent and the products were analyzed. The liquefaction yields decreased in the order: liptinite > vitrinite > inertinite. The liptinite provided the most oil, a material that is similar to crude oil, but also contains higher molecular weight products with large amounts of oxygen, sulfur, and nitrogen. The work showed that the macerals do not react synergistically during liquefaction. Further, the least reactive inertinites, which constitute 15% of this coal, are not converted into desirable products. Therefore, inertinite removal prior to liquefaction can potentially improve process efficiency. This study furthered our understanding of liquefaction behavior of individual macerals, determined differences in product characteristics, and determined that interactions among the different maceral groups during liquefaction do not occur.

12635 (CEA-CONF–11687) **Raman spectroscopic investigation of lanthanides and actinides complexation by pyridine-2-carboxamide.** Livet, J.; Cordier, P.Y.; Condamines, N. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 10p. (CONF-9304213–: Actinides meeting, Buehl (Germany), 20-23 Apr 1993). Order Number DE94617429. Source: OSTI; NTIS (US Sales Only); INIS.

Pyridine 2 - carboxamides - more commonly named picolinamides - are studied in CEA Fontenay-aux-Roses. Their possible ability to separate Actinides from Lanthanides could make them interesting in nuclear wastes processing. We have undertaken a Raman spectroscopic investigation of the reactions of unsubstituted picolinamides with the proton and 4f and 5f metallic cations in aqueous solution because pyridine 2 - carboxamide: - is fairly soluble in water, where Raman Spectroscopy is a good investigation method for studying complexation reactions, - possess strong characteristic vibrations: (a) pyridine cycle vibrations at 1000 and 1046 cm^{-1}. (b) C = O bond vibration around 1675 cm^{-1}, sensitive to complexation with proton and metallic ions. For more convenience we have worked in chloride media instead of the more frequent nitrate medium to prevent the strong disturbing nitrate vibration at 1047 cm^{-1}. (author).

12636 (CEA-R–5648) **Definition of a process for the recovery of ultra traces of Pu^{238} from a 300 Kg depleted uranium batch.** Maillard, C. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Direction du Cycle du Combustible; Paris-11 Univ., 91 - Orsay (France). Nov 1992. 246p. (In French). Order Number DE94617430. Source: OSTI; NTIS (US Sales Only); INIS.

In order to measure the half life of the double beta decay of U^{238}, a process for the recovery of trace amounts of Pu^{238} (about 30 000 atoms) from a 300 kg batch of depleted uranium has been studied and tested. The process includes a Pu (IV) valency adjustment step with nitrous oxide, followed by nine chromatographic cycles (plutonium decontamination factor up to 10^{11} have been achieved for Th, Pa and U). The procedure to realize the alpha spectrometry measurement has also been defined. Full scale apparatus have been set in the CRN facility near STRASBOURG. The first part of the experiment (U^{238} purification before one year aging and measurement of the extracted Pu^{238} traces) has been realized. The results of the Pu traces counting allows the validation of the chemical process but also show an important Pu^{238} contamination certainly a consequence of the TCHERNOBYL accident. (author). 76 refs., 63 tabs., 49 figs.

12637 (CONF-931081–Absts.) **Abstracts of papers thirty-fourth ORNL/DOE conference on analytical chemistry in energy technology.** Oak Ridge National Lab., TN (United States). [1993]. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 34. ORNL/DOE conference on analytical chemistry in energy technology; Gatlinburg, TN (United States); 5-7 Oct 1993. Order Number DE94007130. Source: OSTI; NTIS; GPO Dep.

Less than 100 abstracts are included.

12638 (CONF-940412–4) **Atomic scale structure and chemistry of interfaces by Z-contrast imaging and electron energy loss spectroscopy in the STEM.** McGibbon, M.M.; Browning, N.D.; Chisholm, M.F.; Pennycook, S.J. Oak Ridge National Lab., TN (United States). Dec 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 39. international symposium of the Society for the Advancement of Material and Process Engineering and exhibition; Anaheim, CA (United States); 11-14 Apr 1994. Order Number DE94006562. Source: OSTI; NTIS; GPO Dep.

The macroscopic properties of many materials are controlled by the structure and chemistry at the grain boundaries. A basic understanding of the structure-property relationship requires a technique which probes both composition and chemical bonding on an atomic scale. The high-resolution Z-contrast imaging technique in the scanning transmission electron microscope (STEM) forms an incoherent image in which changes in atomic structure and composition can be interpreted intuitively. This direct image allows the electron probe to be positioned over individual atomic columns for parallel detection electron energy loss spectroscopy (PEELS) at a spatial resolution approaching 0.22nm. The bonding information which can be obtained from the fine structure within the PEELS edges can then be used in conjunction with the Z-contrast images to determine the structure at the grain boundary. In this paper we present 3 examples of correlations between the structural, chemical and electronic properties at materials interfaces in metal-semiconductor systems, superconducting and ferroelectric materials.

12639 (DOE/CH–9215) **Assessment of subsurface VOCs using a chemical microsensor array: Final report.** Batterman, S.A. (Michigan Univ., Ann Arbor, MI (United States). School of Public Health); Zellers, E.T. Argonne National Lab., IL (United States); Michigan Univ., Ann Arbor, MI (United States). School of Public Health. Jun 1993. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008065. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of laboratory investigations of several performance parameters relevant to surface-acoustic-wave (SAW) chemical sensor arrays for the measurement of volatile organic compounds (VOCs) in contaminated soil and groundwater.

The small size, low cost, sensitivity and selectivity of such instruments promise improvements in the quality and quantity of data used to guide site assessment and restoration efforts. In this investigation, calibrations were performed for 15 different coated SAW sensors. Each sensor was exposed to six VOCs selected to represent three chemical classes of contaminants that are commonly found at waste sites (i.e., aliphatic, aromatic and chlorinated hydrocarbons). A new pattern recognition method was developed for determining which coated sensors would maximize the selectivity and accuracy of quantitation for a given set of vapor contaminants. Using this method, an optimal subwet of four coated sensors was selected for testing in a prototype microsensor instrument. Additional laboratory experiments were performed with this optimized array to assess the limits of detection and linear response ranges for the representative vapors, as well as the additivity of responses to vapors in binary mixtures, temperature and humidity effects, aging effects, and other performance parameters related to the application of this technology to soil and groundwater VOC monitoring. Results demonstrate that SAW microsensor arrays can identify and quantify specific VOCs at concentrations in the μg/L to mg/L range when present alone or in simple (e.g., binary) mixtures. SAW sensor technology offers a potentially effective alternative to existing field instrumentation for headspace analysis, soil vapor monitoring, and vacuum extraction process monitoring of VOCs in subsurface media.

12640 (DOE/ER/13832–36) **Metal ion complexation by ionizable crown ethers: Progress report, January 1, 1991–December 31, 1993.** Bartsch, R.A. Texas Tech Univ., Lubbock, TX (United States). Jul 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-88ER13832. Order Number DE94008301. Source: OSTI; NTIS; GPO Dep.

Cyclic and acyclic polyether compounds with pendent carboxylic acid, phosphonic acid monoethyl ester, sulfonic acid, phosphinic acid and hydroxamic acid groups have been synthesized. The proton-ionizable polyethers can come with and without lipophilic groups. Two types of lipophilic di-ionizable lariat ethers have been prepared. Conformations of proton-ionizable lariat ethers have been probed. Competitive alkali metal cation transport by syn-(decyl)dibenzo-16-crown-5-oxyacetic acid and lipophilic proton-ionizable dibenzo lariat ethers in polymer-supported liquid membranes was studied. Complexation of alkali metal cations with ionized lariat ethers was studied. Condensation polymerization of cyclic and acyclic dibenzo polyethers containing pendent mono-ionizable groups with formaldehyde produces novel ion exchange resins with both ion exchange sites for metal ion complexation and polyether binding sites for metal ion recognition. Resins prepared from lariat ether dibenzo phosphonic acid monoethyl esters show strong sorption of divalent heavy metal cations with selectivity for Pb^{2+}.

12641 (DOE/ER/14315–T1) **The hydrophobic character of nonsulfide mineral surfaces as influenced by double-bond reactions of adsorbed unsaturated collector species: Progress report, 15 December 1992–14 December 1993.** Miller, J.D. Utah Univ., Salt Lake City, UT (United States). Jul 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER14315. Order Number DE94008571. Source: OSTI; NTIS; GPO Dep.

Different collector adsorption phenomena including adsorption density, adsorption state, and conformation have been examined for soluble salt, semi-soluble salt and insoluble oxide mineral systems. In the case of the soluble salt system, the influence of crystal lattice defects on the surface charge of KCl and its flotation response was studied. In the case of semi-soluble salt minerals, the behavior of fatty acid collectors adsorbed at the surfaces of calcite and fluorite was determined by in-situ Fourier transform infrared internal reflection spectroscopy (FT-IR/IRS), multichannel laser Raman spectroscopy (MLRS), and Langmuir-Blodgett (LB) techniques. Finally, changes in the hydrophobic character of the insoluble oxide mineral surfaces of sapphire and quartz were examined with respect to the aggregative nature of the adsorbed collector phase. A number of papers and presentations were prepared from this research and these contributions are listed at the end of this progress report.

12642 (INIS-BR–3281) **Impurities in sugar cane and their influence on industrial processing evaluated by nuclear techniques.** Bacchi, M.A. (Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil)); Fernandes, E.A.N.; Ferraz, E.S.B. Sao Paulo Univ., Piracicaba, SP (Brazil). Escola Superior de Agricultura Luiz de Queiroz. 1990. 13p. (In Portuguese). (CONF-9007260–: 19. Brazilian Congress on Agricultural Engineering, Piracicaba (Brazil), 16-20 Jul 1990). Order Number DE94620258. Source: OSTI; NTIS (US Sales Only); INIS.

During the cutting and loading operations, impurities, mainly soil, are added to sugar cane in amounts that can impair industrial processing due to excessive wear of metallic members and contamination of juice and bagasse. Mechanization of loading operation has showed a considerable enhancement of the impurity content, leading to the improvement of cane washing technology. Nevertheless, for a correct understanding of the problem and the process optimization, it is necessary and exact and fast quantification of these impurities as well as of its consequences. Nuclear techniques, in special neutron activation analysis, have been proved to be appropriate for estimating soil level in sugar cane, washing process efficiency and wearing of cases and moving parts. (author).

12643 (INIS-mf–13749, pp. 3) **Laser ultrasensitive spectroscopy of trace elements.** Letokhov, V.S. (AN SSSR, Moscow (Russian Federation). Inst. Spektroskopii). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER SPECTROSCOPY; COMPARATIVE EVALUATIONS; ELEMENTS; RESONANCE IONIZATION MASS SPECTROSCOPY; TRACE AMOUNTS

12644 (INIS-mf–13749, pp. 4) **Laser - induced multiphoton IR excitation and dissociation of molecules.** Letokhov, V.S. (AN SSSR, Moscow (Russian Federation). Inst. Spektroskopii). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER RADIATION/molecules; DISSOCIATION; EXCITATION; INFRARED SPECTRA; MOLECULES

12645 (INIS-mf–13749, pp. 50-51) **Stimulated Raman spectroscopy for the determination of organic compounds in process streams.** Ghaziaskar, H.S. (Carleton Univ., Ottawa, ON (Canada). Dept. of Chemistry); Lai, E.P.C. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC COMPOUNDS/raman spectroscopy; CHEMICAL EFFLUENTS; FLOW RATE; REAL TIME SYSTEMS; SENSITIVITY; SPECTRA; SPECTRAL SHIFT; STIMULATED EMISSION; TEMPERATURE DEPENDENCE

12646 (INIS-mf–13749, pp. 52-53) **Raman scattering in gallium selenide and sulfide films.** Ibragimov, T.D. (AN Azerbajdzhanskoj SSR, Baku (Azerbaijan). Inst. Fiziki). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GALLIUM SELENIDES/raman spectra; GALLIUM SULFIDES/raman spectra; BACKSCATTERING; FREQUENCY DEPENDENCE; PERMITTIVITY; RAMAN EFFECT; THIN FILMS; VIBRATIONAL STATES

12647 (INIS-mf–13749, pp. 54) **Time-resolved site-selection spectroscopy investigation of $Y_3(Al_{1-x}Ga_x)_5O_{12}:Nd^{3+}$ crystals.** Zokai, M. (Isfahan Univ., (Iran, Islamic Republic of). Physics Dept.); Powell, R.C.; Imbusch, G.F.; Dibartolo, B. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ALUMINIUM OXIDES/spectroscopy; GALLIUM OXIDES/spectroscopy; NEODYMIUM IONS/spectroscopy; YTTRIUM OXIDES/spectroscopy; SPECTROSCOPY; CRYSTAL FIELD; CRYSTALS; ENERGY TRANSFER; EXCITATION

12648 (INIS-mf–13749, pp. 98) **Laser fluorimetry of dust aerosol.** Abdullaev, S.F. (S.U. Umarov Physico-Technical Inst. of Tadjik Academy of Sciences (Tajikistan)); Nazarov, B.I.; Saliev, M.A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DUSTS/fluorescence spectroscopy; AEROSOLS; DUSTS; RAMAN SPECTRA; WATER

12649 (INIS-mf–14141) **Neutron diffraction by monocrystals of organoelement compounds with intra- and intermolecular hydrogen bridge bond: interim report.** Becker, J.; Hauser, H.D. Stuttgart Univ. (Germany). Inst. fuer Anorganische Chemie. 29 Jan 1988. 10p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03BE1STU. Order Number DE94747621. Source: OSTI; NTIS (US Sales Only); INIS.

There were considerable experimental difficulties in the preparation of monocrystals of suitable dimensions for the neutron diffraction experiment. The specimens finally achieved are the enolisomeric dimesitoylphosphane and dimesitoylarsane. Due to the compounds' thermal lability and extremely strong sensitivity to oxidation, the process of crystallization has to be started anew in every case shortly before the experiment is performed. In order to avoid the difficulties resulting from this fact, we have tried to prepare systems of simpler structure and started work with monolithesium phosphide 1.2 dimethoxy ethane $(LiPH_2.DME)_\infty$ and alkali metal silanide $MSiH_3$. The work with the phosphide has been successful, and we could start the neutron diffraction experiments. (orig./BBR)

12650 (INIS-mf–14142) **Neutron diffraction by monocrystals of inorganic and elementary organic compounds: interim report.** Becker, G.; Hauser, H.D. Stuttgart Univ. (Germany). Inst. fuer Anorganische Chemie. 1992. 8p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03BE2STU. Order Number DE94747620. Source: OSTI; NTIS (US Sales Only); INIS.

The phase of preparation and X-ray structural analysis of the compounds has been completed following the synthetical preparation of compounds sensitive to oxidation and pyrolysis, in this case: phosphonic acid, potassium silanide, lithium dihydrogenphosphide * DME, bislithium-tri(tert.butyl)alanate, dibromophenylbismuthate, potassium tetrahydride aluminate, and phosphinic acid. The work was started is neutron diffraction experiments for detecting the positions of the hydrogen and carbon atoms, in order to analyse space group problems. (BBR)

12651 (INIS-mf–14143) **Investigation of intermolecular interactions in condensed phases, applying EXAFS spectroscopy and X-ray diffraction, using anomalous scattering: interim report.** Bertagnolli, H. Wuerzburg Univ. (Germany). Inst. fuer Physikalische Chemie. 30 Sep 1990. 4p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 05369FAB; Foerderkennzeichen BMFT 05469F Order Number DE94747619. Source: OSTI; NTIS (US Sales Only); INIS.

Applying EXAFS spectroscopy, the hydrophobic interaction has been investigated, which is of great significance in biology and biochemistry. The model systems used for these studies are solutions of rare gases in water, ethanol and n-propanol. A multichannel analyser has been used to measure the anomalous scattering to electron transfer interactions in bromobenzene and ethyl bromide. (orig./BBR)

12652 (IPEN-PUB–392) **Analysis of neodymium oxide for rare earth impurities by inductively coupled plasma atomic emission spectrometry.** Paula Reino, L.C. de; Adami, F.A.C.; Lordello, A.R. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). Jun 1993. 18p. (In Portuguese). Order Number DE94615287. Source: OSTI; NTIS (US Sales Only); INIS.

A procedure for the determination of the rare earths elements in neodymium oxide with purity grade above 99% by inductively coupled plasma optical emission spectrometry is described. Determination limits were 0,005% for the elements Eu, Dy, Gd, Tb, Ho and Y and 0,01% for Sm and La. The precision of the method was evaluated through the relative standard deviation (RSD) for individual rare earth elements. The values lies in the range of 3 -7% for most of them but lanthanum, has shown 13% RSD. (author).

12653 (IPNO-DRE–92-12) **Continuous purification of ^{223}Fr from its decay-products on nickel hexacyanoferrate(II) composite ion exchanger.** Szeglovski, Z. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Constantinescu, O.; Abdul-Hadi, A.; Ardisson, G.; Hussonnois, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1992. 11p. Order Number DE94617431. Source: OSTI; NTIS (US Sales Only); INIS.

Continuous isolation and purification of ^{223}Fr from ^{227}Ac and its daughters has been performed. ^{223}Fr was sorbed on a column filled with nickel hexacyanoferrate(II) composite ion exchanger and the decay-products were continuously eluted with 0.01M EDTA solution. So, for the first time, pure γ-spectra of ^{223}Fr, without perturbing γ-lines of its decay products, were recorded. 88 new γ-transitions were put in evidence. (author) 6 refs.; 4 figs.

12654 (KFK–5182) **Trace determination of carbonate pesticides via HPLC-separation with electrochemical and spectralphotometric detection.** Seidel, B.S.; Faubel, W.; Ache, H.J. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Radiochemie. Apr 1993. 58p. (In German). Order Number DE94752458. Source: OSTI; NTIS (US Sales Only).

In this paper, we describe the separation of five carbamates pesticides Carbaryl, Propham, Chlorpropham, Barban and Chlorbufam in aqueous solution by using the high performance liquid chromatography (HPLC) in combination with an electrochemical (HPLC/ELCD) and a conventional ultraviolet-visible diode array (HPLC/UV detection) device. As eluent a mixture of acetonitril/water was used and various buffer solutions were added to avoid hydrolysis reactions of the carbamine acid esters. With both systems, HPLC/ELCD and HPLC/UV, calibration curves for all five pesticides have been recorded and the limites of detection have been determined between 10 and 90 ppb. The performance of the electrochemical device seems to be a factor of about 3 better than the diodearray detector, however the 0,1 ug/1 (0,1 ppb) limit for the maximum amount of pesticides in drinking water can not be reached without a preconcentration step. (orig.)

12655 (LA-UR–94-493) **Recent accomplishments in low-level radioactive waste measurement at Los Alamos.** Midkiff, W.S.; Attrep, M.; Covey, J.R. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–48: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007541. Source: OSTI; NTIS; INIS; GPO Dep.

Is Los Alamos National Laboratory (LANL) the only laboratory that has difficulty measuring low concentrations of alpha radioactivity in wastewater, or do the rest of the nation's laboratories just not realize the lack of precision/accuracy in its own measurements? DOE Order 5400.5 sets 30 pCi/L total alpha as a goal for effluent discharge. The State of Colorado requires 0.05 pCi/L. The EPA is

considering standards in this range for drinking water and therefore, presumably in treated wastewater effluent. How reasonable are these limits with respect to ease and precision/accuracy of routine measurements and real risk to human health and environmental protection? After reviewing the constraints of various analytical methods, the paper describes a method using ^{236}Pu and ^{243}Am as traces to determine low levels of alpha in water samples.

12656 (LBL–35155) **Recovery of propylene glycol from dilute aqueous solutions via reversible reaction with aldehydes.** Broekhuis, R.R. (Univ. of California, Berkeley, CA (United States). Dept. of Chemical Engineering); Lynn, S.; King, C.J. Lawrence Berkeley Lab., CA (United States). Dec 1993. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007499. Source: OSTI; NTIS; GPO Dep.

A means is proposed for separating propylene glycol and other compounds bearing multiple hydroxyl groups by reversible chemical reaction. Glycols react with aldehydes in cyclic acetalization reactions to form substituted dioxolanes. Propylene glycol reacts with formaldehyde and acetaldehyde to form 4-methyl-1,3-dioxolane and 2,4-dimethyl-1,3-dioxolane. The reaction is catalyzed homogeneously by strong mineral acids or heterogeneously by cation exchange resins in the acid form. Separation processes utilizing this reaction would include an acetalization step, several distillative separation steps and finally a hydrolysis step in which the reaction is reversed. Both reaction steps must be forced to completion by removing the reaction product simultaneously. The equilibrium and kinetics of the reaction with formaldehyde were studied experimentally in systems catalyzed by Amberlite IR-120 ion exchange resin. A number of solvents were screened for their ability to extract 2,4-dimethyl-1,3-dioxolane from aqueous solution. Aromatic hydrocarbons exhibited the highest distribution into the organic phase. To achieve an effective separation of propylene glycol from aqueous solution by combined reaction with formaldehyde and distillation, formaldehyde would have to be present in excess and would be difficult and costly to separate from the aqueous solution. In reactive distillation using acetaldehyde as a reactant this is not a problem. A large flow of acetaldehyde would be necessary to recover the propylene glycol sufficiently in a distillative process. In a process combining reaction and extraction into an organic solvent this problem is avoided. Process simulation indicates the energy input of such a process is less than half of the energy required in a triple-effect evaporation process. This benefit is offset by higher capital costs and increased complexity in the reaction/extraction process.

12657 (NIRS-M–93, pp. 106-122) **Analytical methods for naturally occurring alpha-emitting nuclides and their levels.** Yamamoto, Masayoshi (Kanazawa Univ., Tatsunokuchi, Ishikawa (Japan). Low Level Radioactivity Lab.). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Ingestion and inhalation of naturally occurring radionuclides, especially alpha-emitting nuclides, give rise to internal radiation dose. Their contribution to the radiation dose derived from various natural sources is considered to be a little compared with those from inhaled radionuclides, mainly the short-lived decay products of ^{222}Rn, and external radiation dose. However, data on human food chain are urgently to establish more realistic models for internal dose assessment for Japanese. Recent progress in the methods of naturally occurring alpha-emitters such as ^{238}U, ^{232}Th, ^{226}Ra and ^{210}Po for diet and human tissue samples has been reviewed with some measured data. For the determination of ^{238}U and ^{232}Th, alpha-ray spectrometry after chemical separation has been applied widely. Instrumental neutron activation analysis is more sensitive, while, for ^{238}U detection, fission track method using ^{238}U fission reaction is considered to be the most sensitive. Recently, the development of inductively coupled plasma mass spectrometry (ICP-MS) introduced the method for determining ^{238}U and ^{232}Th at pg/ml level. On the other hand, for the determination of ^{226}Ra and ^{210}Po in diet and human materials, alpha-ray spectrometry after chemical purification is more sensitive and accurate by adding yield tracers, ^{225}Ra and ^{209}Po (or ^{208}Po), respectively. (author).

12658 (ORNL/ER/Sub–87-99053/31) **Quality assurance plan for the Close Support Laboratory for the remedial investigation at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Aug 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94001483. Source: OSTI; NTIS; INIS; GPO Dep.

The primary purpose of the Close Support Laboratory (CSL) is to provide rapid radiological screening of investigation-derived samples before they are shipped to off-site laboratories for more detailed analyses. Analyses for volatile organic compounds and miscellaneous water quality parameters are also performed at the CSL. CSL data are also used to select samples for off-site laboratory analysis, for rapid qualitative and quantitative determinations, and for other processes when off-site analysis is not needed and/or is impractical. This plan specifies methods of implementing analytical and radiological protocols and procedures for the documentation, handling, control, and analysis of samples and describes the levels of authority and responsibility for laboratory operation. Specific quality control methods used by the CSL for individual analyses are described in project procedures.

12659 (ORNL/FTR–4837) **Travel to England and Scotland to present two papers on electron microscopy at the Electron Microscopy and Analysis (EMAG) '93 Conference, and University of Glasgow and the University of Birmingham: Foreign trip report, September 13–26, 1993.** Bentley, J. Oak Ridge National Lab., TN (United States). 15 Nov 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94004047. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Purpose of the trip was to present papers at the Electron Microscopy and Analysis Group (EMAG) '93 Conference (Liverpool, England); to present invited seminars at the University of Glasgow, Scotland, and at the University of Birmingham, England; and to discuss electron microscopy and materials science research at the University of Glasgow, Scotland, at the University of Birmingham, England, and at the University of Cambridge, England.

12660 **Ventilation of porous media.** Neeper, D.A. To Dept. of Energy. 1992. Filed date 31 Jan 1992. U.S. patent application 7-829,346. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007353. Source: OSTI; NTIS; GPO Dep.

Methods for distributing gases throughout the interstices of porous materials and removing volatile substances from the interstices of porous materials. Continuous oscillation of pressures and flows results in increased penetration of the interstices by flowing gases and increased transport of gaseous components out of the interstices. The invention is particularly useful in soil vapor extraction.

12661 **Determination of actinides in urine and fecal samples.** McKibbin, T.T. To Dept. of Energy. 1992. U.S. patent application 7-831,017. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE94007352. Source: OSTI; NTIS; GPO Dep.

A method of determining the radioactivity of specific actinides that are carried in urine or fecal sample material is disclosed. The samples are ashed in a muffle furnace, dissolved in an acid, and then treated in a series of steps of reduction, oxidation, dissolution, and precipitation, including a unique step of passing a solution through a chloride form anion exchange resin for separation of uranium and plutonium from americium.

12662 **Light absorption cell combining variable path and length pump.** Prather, W.S. To Dept. of Energy. 1992. Filed date 28 Feb 1992. U.S. patent application 7-843,334. 13p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007338. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a device for use in making spectrophotometric measurements of fluid samples. In particular, the device is a measurement cell containing a movable and a fixed lens with a sample of the fluid therebetween and through which light shines. The cell is connected to a source of light and a spectrophotometer via optic fibers. Movement of the lens varies the path length and also pumps the fluid into and out of the cell. Unidirectional inlet and exit valves cooperate with the movable lens to assure a one-way flow of fluid through the cell. A linear stepper motor controls the movement of the lens and cycles it from a first position closer to the fixed lens and a second position farther from the fixed lens, preferably at least 10 times per minute for a nearly continuous stream of absorption spectrum data.

12663 (SAND–93-1635C) **Determination of BPSG thin-film properties using IR reflection spectroscopy of product wafers.** Niemczyk, T.M. (Univ. of New Mexico, Albuquerque, NM (United States). Chemistry Dept.); Franke, J.E.; Zhang, Lizhong; Haaland, D.M.; Radigan, K.J. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-931108–77: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006591. Source: OSTI; NTIS; GPO Dep.

Borophosphosilicate glass (BPSG) thin films are widely used in the microelectronics industry as passivation layers, planarization layers, low-fusion-temperature dielectrics, etc. Currently available analytical methods for determining boron and phosphorus content in BPSG films do not meet the demands of at-line or in-situ quality control process monitoring. Infrared (IR) spectroscopy satisfies many of the at-line or in-situ issues, but has only recently been capable of providing quantitative results using undoped and unpatterned silicon substrates. Three BPSG calibration sets were analyzed using infrared external reflection-absorption spectroscopy: (1) 21 films deposited on undoped silicon coated with 0.1 μm of silicon dioxide, (2) 21 films deposited on undoped silicon, and (3) 9 films deposited on microelectronics product wafers. A multivariate partial least squares analysis of the spectral data for the first large data set showed that boron content, phosphorus content, and film thickness can be quantified with precisions of 0.10 wt%, 0.12 wt%, and 30 Å, respectively. The second large data set yielded similar results. The precisions obtained for the nine product wafer samples were 0.13 wt%B, 0.09 wt%P, and for film thickness 103 Å.

12664 (SAND–94-8204) **Development of techniques for tagging precursor and essential chemicals.** Swansiger, W.A. (Sandia National Labs., Livermore, CA (United States)); Shepodd, T.J.; Phillips, M.L.F. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-931173–1: 6. international workshop on atomic physics for ion-driven fusion, Santa Fe, NM (United States), 8-12 Nov 1993). Order Number DE94006397. Source: OSTI; NTIS; GPO Dep.

The ability to identify the manufacturers and distributors of chemicals seized in raids of illicit drug labs would be of great value in controlling the diversion of these chemicals. We developed a tagging scheme based on the addition of sub-ppM concentrations of various combinations of rare-earth elements to the target chemicals and evaluated a number of techniques for detecting the tags. We developed soluble tags for tagging liquids and selected Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) as the preferred detection technique. We developed insoluble tags for tagging solids and developed methods to analyze them and mix them into solid precursors. We have successfully demonstrated the tagging of several solvents and two of the precursor chemicals used in one of the most popular clandestine methamphetamine syntheses (ephedrine reacting with hydriodic acid/red phosphorus). The tagging scheme is capable of yielding tens of thousands of signatures (using holmium as an internal standard and up to 9 rare-earths at up to 3 concentrations yields $3^9 - 1 = 19{,}682$ signatures) and is applicable to most of the chemicals on the precursor and essential chemicals list. In the concentrations employed, the tags are safe enough to be added to pharmaceuticals and cheap enough to tag tanker loads of chemicals.

12665 (UCRL-JC–112979) **Using laser absorption spectroscopy to monitor composition and physical properties of metal vapors.** Berzins, L.V. Lawrence Livermore National Lab., CA (United States). 3 Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309199–8: Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation, Boston, MA (United States), 7-10 Sep 1993). Order Number DE94001530. Source: OSTI; NTIS; INIS; GPO Dep.

The Atomic Vapor Laser Isotope Separation (AVLIS) program has been using laser absorption spectroscopy to monitor vapor densities for over 15 years. Laser absorption spectroscopy has proven itself to be an accurate and reliable method to monitor both density and composition. During this time the diagnostic has moved from a research tool toward a robust component of a process control system. The hardware used for this diagnostic is discussed elsewhere at this symposium. This paper describes how the laser absorption spectroscopy diagnostic is used as a component of a process control system as well as supplying detailed measurements on vapor densities, composition, flow velocity, internal and kinetic temperatures, and constituent distributions. Examples will be drawn from the uranium AVLIS program. In addition potential applications such as composition control in the production of metal matrix composites or aircraft alloys will be discussed.

4002 Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 11460, 11483, 11485, 11492, 11494, 11500, 11544, 11545, 11546, 11554, 11712, 11738, 11760, 11765, 11918, 12100, 12420, 12421, 12477, 12582, 12594, 12598, 12614, 12620, 12640, 12656, 12684, 12701, 12702, 12704, 12708, 12989, 13003, 13319, 13829, 13832, 13833, 13837

12666 (ANL/CHM/PP–76828) **On the generation of H_2 from formaldehyde in basic aqueous solutions.** Kapoor, S.; Barnabas, F.; Jonah, C.D.; Sauer, M.C. Jr.; Meisel, D. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008488. Source: OSTI; NTIS; GPO Dep.

The generation of H_2 from formaldehyde and glyoxalate in aqueous solutions at high concentrations of hydroxide has been studied in the temperature range 21-60°C. The reaction is first order in formaldehyde and is of higher than first order in hydroxide concentration. Conversion ratio of the aldehyde to H_2 increases on increasing OH^- concentration and on raising the temperature. It decreases on increasing aldehyde concentration due to the competition by the Cannizzaro reaction which is second order on the aldehyde. Effective rate constants and activation energies are provided.

12667 (ANL/MSD/PP–71503) **Structures of two precursors to organic charge-transfer salts: 1,3-dithiolo[4,5-b][1,4]dithiin-2-thione and 1,3-dithiolo[4.5-b] [1,4]dithiin-2-one.** Beno, M.A.; Kini, A.M.; Williams, J.M. Argonne National Lab., IL (United States). Sep 1990. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008123. Source: OSTI; NTIS; GPO Dep.

$C_5H_4S_4O$ (1), M_r = 208.343, monoclinic, $P2_1/n$, a = 6.664 (2), b = 16.535 (6), c = 7.281 (2) Å, β = 97.84 (3), V = 794.8 (5) $Å^3$, Z = 4, D_x = 1.741 Mg m^{-3}, λ (MoKα) = 0.71073 Å, μ = 1.07 mm^{-1}, F(000) = 424, T = 298 K, R(F) = 0.048 for 2338 reflections. $C_5H_4S_5$ (2), M_r = 224.39, monoclinic, $P2_1/n$, a = 10.765 (2), b = 5.879 (2), c = 13.479 (2) Å, β = 92.66 (2), V = 852.2 (4) $Å^3$, Z = 4, D_x = 1.749 Mg m^{-3}, λ (MoKα) = 0. 71073 Å, μ = 1.23 mm^{-1}, F(000) = 456, T = 298 K, R(F) = 0.059 for 2491 reflections. Structure determinations for intermediates 1 and 2 were undertaken as part of a qualitative theoretical study of the changes in the geometries of organic donor molecules which occur with charge transfer. Although the geometries of 1 and 2 are nearly identical, the packing of these molecules in the unit cells is quite different. The molecular packing

patterns are undoubtedly related to differences in the C-H···chalcogen interactions for the thio and keto substituents.

12668 (BARC–1993/P/005) **Applied Chemistry Division progress report for the period 1990-1992.** Bharadwaj, S.R. (Bhabha Atomic Research Centre, Bombay (India). Applied Chemistry Division); Kishore, K.; Ramshesh, V. (eds.). Bhabha Atomic Research Centre, Bombay (India). 1993. 234p. Order Number DE94615301. Source: OSTI; NTIS (US Sales Only); INIS.

The report covers the research and development (R and D) activities of the Applied Chemistry Division for the period January 1990 to December, 1992. R and D programmes of the Division are formulated to study the chemical aspects related to nuclear power plants and heavy water plants. The Division also gives consultancy to DAE units and outside agencies on water chemistry problems. The thrust areas of the Division's R and D programmes are : decontamination of nuclear facilities, metal water interaction of the materials used in PHT system, chemistry of soluble poisons, biofouling and its control in cooling water circuits, and treatment of cooling waters. Other major R and D activities are in the areas of: solid state reactions and high temperature thermodynamics, primary coolant water chemistry, speciation studies in metal amine systems, high temperature aqueous radiation chemistry. The Division was engaged in studies in novel areas such as dental implants, remote sealing of pipes in MS pipes, and cold fusion. The Division also designed and fabricated instruments like the Knudsen cell mass spectrometer, calorimeters and developed required software. All these R and D activities are reported in the form of individual summaries. A list of publications from the Division and a list of the staff members of the Division are given at the end of the report. (author). tabs., figs., appendices.

12669 (BNL–60012) **Femtosecond dynamics in hydrogen-bonding solvents: Temperature- dependence of the inertial and diffusive relaxation of liquid acetic acid.** Chang, Y.J.; Castner, E.W. Jr. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940593–1: 9. international conference on ultrafast phenomena, Dana Point, CA (United States), 1-5 May 1994). Order Number DE94006572. Source: OSTI; NTIS; GPO Dep.

Acetic acid ultrafast dynamics were measured using femtosecond optical-Kerr spectroscopy for temperatures ranging from near the melting to boiling points of the liquid.

12670 (BNL–60013) **Femtosecond transient dichroism/birefringence studies of solute- solvent friction and solvent dynamics.** Chang, Y.J. (Brookhaven National Lab., Upton, NY (United States)); Castner, E.W. Jr.; Konitsky, W.; Waldeck, D.H. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940593–2: 9. international conference on ultrafast phenomena, Dana Point, CA (United States), 1-5 May 1994). Order Number DE94006571. Source: OSTI; NTIS; GPO Dep.

Ultrafast, heterodyne, polarization spectroscopies are used to measure solute-solvent frictional coupling and characterize the neat solvent's relaxation dynamics on femtosecond and picosecond timescales.

12671 (CDM/LSO/DSO–57) **Determination of alkylphosphates esters by complexation with perchloric acid: Application to the determination of TBP and derivatives in the synthesis mixtures.** Azzouz, A. (Centre de Developpement des Materiaux, Algiers (Algeria)); Boudoukha, Chahrazed; Attou; Mouloud; Amedikouh; Abdelwahab. Secretariat d'Etat a la Recherche, Algiers (Algeria). Oct 1993. 17p. (In French). Order Number DE94617432. Source: OSTI; NTIS (US Sales Only); INIS.

The opportunity to apply the complexation of TBP with perchloric acid to the determination of this ester and its derivatives, i.e. mono- and dibutylphosphoric acids (H2MBP and HDBP) in the synthesis mixtures was investigated. The complexes between the esters and perchloric acids are insoluble in the such complexes seem to be proportional to the concentration of each ester. The effect of the presence of H2MBP and HDBP upon the determination of TBP was also examinated. It was found that small amounts of such derivatives, i.e. smaller than 15%, TBP can be easily determined.

12672 (CEA-R–5643) **Redox thermodynamic data of plutonium in acidic and carbonate media. Pu(V) stability.** Capdevila, H. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Direction du Cycle du Combustible; Paris-11 Univ., 91 - Orsay (France). 5 Jun 1992. 197p. (In French). Order Number DE94617433. Source: OSTI; NTIS (US Sales Only); INIS.

Pu redox equilibria are studied in acidic and carbonate media in this thesis, to build a thermodynamic data bank consistent with the TDB (NEA-OECD) one and in connection with radioactive waste disposal programs. Literature is discussed and reinterpreted. The experimental method is tested with Uranium preliminary measurements. The reversible redox potentials (PuO_2^+ and Pu^{4+}/Pu^{3+}) are measured using the cyclic voltametric technique in perchloric media at several ionic strengths (from 0.5 to 3M) and temperatures (from 0 to 70 deg C). The Specific Interaction Theory (SIT) is used to measured activity coefficients and to extrapolate data to the standard conditions. The potentials variations versus temperature are linear in first approximation: the entropy changes are found constant from 0 to 70 deg C and the heat capacity changes are within uncertainties. The standard constant of PuO_2^+ disproportionation into PuO_2^{2+} and Pu^{3+} is deduced from spectrophotometric measurements performed in perchloric media around pH=1 where Pu^{4+} hydrolysis is discussed. The Pu non-reversible standard potentials (PuO_2^{2+}/Pu^{4+} for instance) are then calculated and validated with a spectrophotometric study of Pu^{4+} formation from PuO_2^{2+} and Pu^{3+} in a 1M perchloric acidic solution. The Pu(VI/V) redox potential, activity coefficients and entropies are measured using the same technique in concentrated carbonate media. The limiting complex standard formation constants and the redox potential shifts (between acidic and carbonate media) are then discussed among the U, Np, Pu and Am actinides. A spectrophotometric study of the equilibrium between the complexes with 5 and 4 carbonate ligands allowed to measure Pu(IV) limiting complex stability at several ionic strengths. (author). 26 tabs., 46 figs., 95 refs.

12673 (DOE/ER/13774–4) **[Studies of the fundamental nature of catalytic acidity, sites and intermediates]: Final performance (technical progress) report.** Pittsburgh Univ., PA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13774. Order Number DE94006999. Source: OSTI; NTIS; GPO Dep.

This project was concerned with the fundamental nature of catalyst acidity in the H-zeolites and silica/alumina cracking catalysts. This report summarizes the progress on this project over the past five years. The titles of the twelve papers generated by this research are provided in the attached bibliography in chronological order.

12674 (DOE/ER/14333–1) **Time-resolved analytical methods for liquid/solid interfaces: Progress report, March 1, 1993–November 15, 1993.** Harris, J.M. Utah Univ., Salt Lake City, UT (United States). Dept. of Chemistry. 15 Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER14333. Order Number DE94008352. Source: OSTI; NTIS; GPO Dep.

Chemical phenomena occurring at boundaries between insulating solids and liquids (adsorption, partition, monolayer self-assembly, catalysis, and chemical reactions) are important to energy-related analytical chemistry. These phenomena are central to chromatography, solid-phase extraction, immobilized analytical reagents, and optical sensors. Chemical interactions in these processes cannot generally be identified solely by equilibrium surface concentrations, since the steady-state behavior does not reveal the mechanism or rates of surface reactions. Goal therefore is to develop surface-sensitive spectroscopies by which chemical kinetics at liquid/solid interfaces can be observed on time-scales from nanoseconds to seconds. In the first year, we have used Joule-discharge heating kinetics to study pore structure of silica gels; effects of pore diameter, particle size, and chemical modification on pore connectivity were investigated. Temperature-jump relaxation measurements of sorption/desorption kinetics at liquid/solid interfaces were also carried out using Joule heating; kinetic barriers to

sorption of ions from solution were found for both C18 and Cl surfaces. Through a collaboration with Fritz-Haber Institute in Berlin, we were able to acquire laser temperature-jump data on kinetics at liquid/solid interfaces using a colloidal sample. We also quantified the rate of migration of covalently attached ligands on silica surfaces; from the temperature dependence, the large energy barrier to migration was estimated. A review of applications of electronic spectroscopy (absorption and fluorescence) to reversed-phase chromatographic interfaces was published.

12675 (DOE/ER/14340–1) **Laser flash photolysis, EPR and raman studies of liquids at elevated pressures: Progress report, April 1, 1993–November 19, 1993.** Eyring, E.M. Utah Univ., Salt Lake City, UT (United States). 19 Nov 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER14340. Order Number DE94008351. Source: OSTI; NTIS; GPO Dep.

A laser flash photolysis kinetic study of a $W(CO)_5$ intermediate reacting with several different substituted 2,2′-bipyridine ligands at pressures up to 150 MPa in liquid toluene has confirmed the considerable influence of steric hindrance on the mechanism of a thermal ring closure reaction. A similar laser flash photolysis kinetic study has been carried out with $Mo(CO)_6$ and several bidentate ligands resembling 2,2′-bipyridine dissolved in supercritical carbon dioxide. A much larger negative activation volume is found in supercritical carbon dioxide than observed previously with this solute system dissolved in liquid toluene. Rate of replacement of one polydentate ligand by another stronger chelating agent in the first coordination sphere of aqueous gadolinium(III) ion was measured over a range of pressures and other variables using a stopped-flow spectrophotometer. Two consecutive first order reaction steps are observed that show acid-catalysis.

12676 (DOE/PC/91303–T8) **Semiconductor electrochemistry of coal pyrite: Technical progress report, July–September 1993.** Osseo-Asare, K.; Wei, D. Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering. Nov 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91303. Order Number DE94007998. Source: OSTI; NTIS; GPO Dep.

Pyrite (FeS_2) synthesis was studied in aqueous solution at room temperature and atmospheric pressure using ferric chloride ($FeCl_3$) and sodium hydrosulfide (NaHS) as reactants, and sodium hexametaphosphate ($(NaPO_3)_6$) as dispersant and crystal growth modifier (to control the particle size of pyrite). The effects of the reaction pH and the concentrations of the reactants and the dispersant on the product characteristics were studied. The pH of the reaction system determines the chemical constitution of the products. Elemental sulfur is produced at pH 2.4. As pH increases, the reaction product becomes a mixture of elemental sulfur plus pyrite at pH 2.9. In the pH range of 3.6 to 5.7, pyrite is formed with a pseudospherical shape and a size of 2 μm. With further increase in pH, amorphous iron sulfides are obtained. Lowering the concentrations of the reactants decreases the particle size of pyrite in the earlier stages of the reaction. However the final particles have the same size irrespective of the initial concentrations of the reactants used in the study. Addition of the dispersant can change the properties of the products. The mechanism of the dispersant action is currently under investigation, in an effort to minimize particle aggregation and produce discrete nanosize pyrite particles.

12677 (DOE/PC/92108–T4) **Technology development for cobalt F-T catalysts: Quarterly technical progress report No. 3, April 1, 1993–June 30, 1993.** Singleton, A.H. Energy International Corp., Pittsburgh, PA (United States). 13 Dec 1993. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92108. Order Number DE94008385. Source: OSTI; NTIS; GPO Dep.

The goal of this project is the development of a commercially viable, cobalt-based Fischer-Tropsch (F-T) catalyst for use in a slurry bubble column reactor. Cobalt-based catalysts have long been known as being active for F-T synthesis. They typically possess greater activity than iron-based catalysts, historically the predominant catalyst being used commercially for the conversion of syngas based on coal, but possess two disadvantages that somewhat lessen its value: (1) cobalt tends to make more methane than iron does, and (2) cobalt is less versatile with low H2/CO ratio syngas due to its lack of water-gas shift activity. Therefore, the major objectives of this work are (1) to develop a cobalt-based F-T catalyst with low (< 5 %) methane selectivity, (2) to develop a cobalt-based F-T catalyst with water-gas shift activity, and (3) to combine both these improvements into one catalyst. It will be demonstrated that these catalysts have the desired activity, selectivity, and life, and can be made reproducibly. Following this experimental work, a design and a cost estimate will be prepared for a plant to produce sufficient quantities of catalyst for scale-up studies.

12678 (DOE/PC/92536–T4) **Oxidation of phenolics in supercritical water: Quarterly technical progress report, September 1, 1993–November 30, 1993.** Savage, P.E. Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92536. Order Number DE94008326. Source: OSTI; NTIS; GPO Dep.

Oxidation reactions are accomplished in an isothermal, high-pressure, flow reactor designed specifically for operation at supercritical water conditions. The reactor feed stream is prepared by mixing two separate streams. One stream is an aqueous solution of the phenolic reactant and the second stream is water with dissolved oxygen. Controlling the flow rates of these two streams allows us to control the reactor residence time and the relative amounts of the phenol and oxygen fed to the reactor. The reactor effluent is cooled and depressorized and then collected for analysis. The gaseous products are analyzed by gas chromatography (GC). The liquid-phase products are analyzed by GC, high-performance liquid chromatography, and GC-mass spectrometry. Our work to date has focused on the oxidation of cresols in SCW. We have explored the effects of temperature, pressure, and the concentrations of o-cresol, oxygen, and water. Table I gives these experimental conditions and the resulting ocresol conversions. We reported a portion of this data in our previous quarterly report. New information is given in the last three columns where we report the molar yields of phenol, CO_2, and CO. Molar yields were calculated as the molar flow rate of a given product divided by the initial molar flow rate of o-cresol and normalized by the stoichiometric coefficient. Earlier, we used the o-cresol conversion data to determine the parameters in a global reaction rate law for o-cresol disappearance.

12679 (IPNO-DRE–92-11) **Sorption behaviour of some I to V group elements on nickel hexacyanoferrate(II) composite ion exchanger.** Szeglovski, Z. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Constantinescu, O.; Hussonnois, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1992. 13p. Order Number DE94617434. Source: OSTI; NTIS (US Sales Only); INIS.

The sorption of Fr, Ra, Pb, Bi, Eu, Zr, Hf, Th, Nb, Pa and U in trace quantities on a composite ion exchanger with nickel hexacyanoferrate(II) from hydrochloric acid media was performed. Particularly radiochemical problems of transactinide elements isolation were discussed. (author) 16 refs.; 4 figs.; 1 tab.

12680 (IS-T–1627) **The intramolecular cyclization of bis-2,5-dimethylene-2,5-dihydrofurans and bis-2,5-dimethylene-2,5-dihydrothiophenes: An approach to macrocycles.** Klumpp, D.A. Ames Lab., IA (United States). 11 Jan 1994. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94007060. Source: OSTI; NTIS; GPO Dep.

The first two papers of this dissertation present our work with the intramolecular cyclizations of a pair of p-quinodimethanes. The p-quinodimethanes were generated by flash vacuum pyrolysis (FVP) and were linked by a bridging chain. The third paper of this dissertation presents our work in the synthetic manipulation of the products formed from the intramolecular reactions of the p-quinodimethanes.

12681 (LA-SUB–94-45) **Progress report for subcontract 9-X33-LO152-1.** Storm, C.B.; Butcher, R.J. Los Alamos National Lab., NM (United States); Howard Univ., Washington, DC (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008167. Source: OSTI; NTIS; GPO Dep.

X-ray structural studies were made for complexes of Co ions with ammonia, 4-nitroimidazole, benzimidazole, aniline, pyridine, DMSO, en, 4-nitropyrazole, histidine, 4-nitrohistidine, 4-chloroimidazole. Synthetic procedures are given. Molecular modeling is discussed.

12682 (NSS-R–272) **Mechanistic studies of the alkaline degradation of cellulose in cement.** Greenfield, B.F. (AEA Decommissioning and Waste Management, Harwell (United Kingdom)); Robertson, G.P.; Spindler, M.W.; Harrison, W.N.; Somers, P.J. Edelstahlwerk Witten AG (Germany). Jul 1993. 86p. (AEA-D and R–0219.). Order Number DE94615302. Source: OSTI; NTIS (US Sales Only); INIS.

The alkaline degradation of cellulose-based materials under conditions simulating those of a deep underground radioactive waste repository has been investigated. A number of key degradation products, of which 2-C-(hydroxymethyl)-3-deoxy-D-pentonic acid (isosaccharinic acid) is the most important, have been synthesised, and the solubilities of their plutonium complexes have been determined. Analysis of leachates of anaerobically degraded cellulose has shown concentrations of organic acids which are broadly consistent with the enhanced plutonium solubilities found in these leachates. Reaction mechanisms have been identified that can lead to isosaccharinic acid production by non-oxidative transformations, which may be catalysed by some divalent cations. (Author).

12683 (UCRL-JC–116104) **Surface chemistry and durability of borosilicate glass.** Carroll, S.A.; Bourcier, W.L.; Phillips, B.L. Lawrence Livermore National Lab., CA (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931108–80: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 29 Nov - 3 dec 1993). Order Number DE94006734. Source: OSTI; NTIS; INIS; GPO Dep.

Important glass-water interactions are poorly understood for borosilicate glass radioactive waste forms. Preliminary results show that glass durability is dependent on reactions occurring at the glass-solution interface. CSG glass (18.2 wt. % Na_2O, 5.97 wt. % CaO, 11.68 wt. % Al_2O_3, 8.43 wt. % B_2O_3, and 55.73 wt. % SiO_2) dissolution and net surface H^+ and OH^- adsorption are minimal at near neutral pH. In the acid and alkaline pH regions, CSG glass dissolution rates are proportional to $[H^+]_{adsorbed}^2$ and $[OH^-]_{adsorbed}^{0.8}$, respectively. In contrast, silica gel dissolution and net H^+ and OH^- adsorption are minimal and independent of pH in acid to neutral solutions. In the alkaline pH region, silica gel dissolution is proportional to $[OH^-]_{adsorbed}^{0.9}$ $_{adsorbed}$. Although Na adsorption is significant for CSG glass and silica gel in the alkaline pH regions, it is not clear if it enhances dissolution, or is an artifact of depolymerization of the framework bonds.

4004 Electrochemistry

Refer also to citation(s) 11482, 11734, 12293, 12676, 13942

4005 Photochemistry

Refer also to citation(s) 11451, 12675, 12687, 12691, 13838

12684 (ANL/CHM/PP–73178) **Aromatic carbonium ions in liquid alkanes and alcohols from laser photoionization and pulse radiolysis.** Trifunac, A.D.; Liu, A.D.; Sauer, M.C. Jr.; Jonah, C.D. Argonne National Lab., IL (United States). 1 May 1991. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008474. Source: OSTI; NTIS; GPO Dep.

Aromatic carbonium ions are observed in photoionization and radiolysis of aromatic compounds in hydrocarbons and alcohols. These aromatic carbonium ions result from the protonation of aromatic molecules by the protonated species of hydrocarbons and alcohols which are ubiquitous in the "high energy" chemistry processes. The condensed-phase optical absorption spectra of aromatic radical cations and aromatic carbonium ions are essentially identical. The assignment of the carbonium ion species is feasible by considering the lifetimes, kinetics, scavenger and solvent effects on radical cation and carbonium ion lifetimes.

12685 (DOE/ER/00038–3676) **Photocatalytic oxidation of 4-chlorophenol on titanium dioxide: A comparison with γ-radiolysis.** Stafford, U.; Gray, K.A.; Kamat, P.V. Notre Dame Univ., IN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76ER00038. (CONF-940248–1: 4. annual symposium on chemical oxidation, Nashville, TN (United States), 16-18 Feb 1994). Order Number DE94006510. Source: OSTI; NTIS; GPO Dep.

To gain useful insight into the mechanistic details of the TiO_2 photocatalyzed oxidation of halogenated organic compounds, the intermediates produced during the photocatalytic degradation of 4-chlorophenol (4-CP) have been compared with those produced during γ-radiolysis. Photocatalytic degradation of 4-CP produces aromatic intermediates consistent with γ-radiolytic hydroxyl radical oxidation, but the distribution of the intermediates differs. The surface area of TiO_2 has an important influence on the intermediate distribution suggesting that the presence of surface influences the reaction pathway. The course of photocatalytic transformation of 4-CP involves a combination of hydroxyl radical oxidation, direct electron transfer and surface chemical reactions contributing to the disappearance of 4-CP and its reaction intermediates in TiO_2 slurries.

12686 (ENEA-RT-INN–92-40, pp. 5-12) **CARS monitoring of U.V. laser induced graffitization of benzene.** Fantoni, R. (ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione); Giorgi, M.; Lipinska-Kalita, K.E.; Martelli, S. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Feb 1993. (CONF-9209307–Exc.: International workshop on laser deposition of advanced materials, Tito (Italy), 28-30 Sep 1992). In *Contributions to CNR-International Workshop on laser deposition of advanced materials.* 28p. Order Number DE94716511. Source: OSTI; NTIS (US Sales Only).

Relevant to studies on benzene as a precursor of a large family of air pollutants, a broad-band CARS system was used to monitor on-line the laser induced dissociation of benzene at 266 nm. The laser induced primary decomposition and secondary reactions were studied under collisional conditions upon the addition of inert (N_2) and reactive (O_2) partners. Reaction intermediates produced in electronically excited states were detected by time resolved spontaneous emission spectroscopy. The composition and structure of the solid particles produced was investigated. Preliminary X-ray diffraction studies indicate the presence of crystalline pyrolytic carbon.

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Refer also to citation(s) 12685

12687 (ANL/CHM/PP–74944) **High-energy chemical processes: Laser irradiation of aromatic hydrocarbons.** Trifunac, A.D.; Liu, A.D.; Loffredo, D.M. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008107. Source: OSTI; NTIS; INIS; GPO Dep.

Recent studies of the high-energy photochemical degradation of polycyclic aromatic hydrocarbons (PAHs) in solution have furthered our fundamental understanding of the way in which radiation interacts with matter. A new comprehensive mechanism that unifies many of the seemingly contradictory observations in radiation and photochemistry has been proposed on basis of evidence gathered using specialized techniques such as transient optical spectroscopy and transient dc conductivity. The PAH molecules were activated by two-photon ionization, and behavior of the transient ions were monitored as a function of photon energy. It was found that a greater percentage of ions retain sufficient energy to decompose when higher energy light was used. When these cations decompose they leave a trail of products that establish a "high-energy" decomposition pathway that involves proton transfer from the ion, a mechanism hitherto not considered in photoionization processes.

12688 (ANL/CHM/PP–75063) **Arene-thioether mixed complex radical cations.** Werst, D.W. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008104. Source: OSTI; NTIS; INIS; GPO Dep.

Studies of radiolytically generated radical cations in aromatic hydrocarbon solvents have led to the first direct characterization of monomeric thioether radical cations in liquid solution. Observation of these very reactive chemical intermediates is made possible by the great sensitivity of fluorescence-detected magnetic resonance (FDMR) and by solvent stabilization of the thioether radical cations via electron donation. Monomeric thioether radical cations in arene solvents such as toluene exist as arene-thioether mixed complex radical cations – the first π-lone pair mixed complex radical cations ever observed. Such orbital interactions are of fundamental importance for open-shell intermediates as they have consequences for both electronic structure and reactivity. Thioether radical cations provide a valuable test system to probe the chemical influence of orbital interactions that are generic to all π-type and heteroatom-containing organic radical cations, and magnetic resonance provides unsurpassed structural resolution for condensed-phase paramagnetic intermediates.

12689 (ANL/CHM/PP–76819) **Observation of an aromatic radical anion dimer: $(C_{10}F_8)_2^{\bullet -}$.** Werst, D.W. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008481. Source: OSTI; NTIS; INIS; GPO Dep.

Radical cation dimers are observed for many alkenes and aromatic hydrocarbons as products of the reaction between monomer radical cation and neutral molecule. In most cases, the dimer radical anions, formed via reaction of the monomer radical anion with a neutral molecule, have not been observed. Here we report the observation of the dimer radical anion of octafluoronaphthalene, formed by reaction of $C_{10}F_8^{\bullet -}$ with the neutral parent molecules in nonpolar solvents following pulse radiolysis. Both monomer and dimer ions have been characterized by EPR spectra obtained by the time-resolved fluorescence-detected magnetic resonance.

12690 (CONF-9304148–2) **A comparison between two Monte Carlo codes on determination of transient chemical yields.** Hamm, R.N. (Oak Ridge National Lab., TN (United States)); Turner, J.E.; Chatterjee, A. Oak Ridge National Lab., TN (United States); Lawrence Berkeley Lab., CA (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Department of Energy Monte Carlo workshop; Irving, CA (United States); 28-29 Apr 1993. Order Number DE94007224. Source: OSTI; NTIS; GPO Dep.

Monte Carlo computer codes have been independently developed at several laboratories for performing calculations of radiolysis of water. The different codes involve a wide variety of models and related assumptions in treating the many physical and chemical processes that occur. Because few detailed aspects of such computations can be directly checked by experiment, it is important to make comparisons of various predicted microscopic distributions. This paper compares results obtained with codes developed at Lawrence Berkeley Laboratory and at Oak Ridge National Laboratory. Both codes were used to calculate the spatial distributions of various radical species in spurs along the tracks of energetic electrons. Similarities and differences in the results of this preliminary study are shown. Additional work is planned.

12691 (DOE/ER/00038–3674) **Radiation Laboratory, University of Notre Dame: Quarterly report, October 1–December 31, 1993.** Notre Dame Univ., IN (United States). Radiation Lab. 17 Feb 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76ER00038. (NDRL–3674; Q–146). Order Number DE94007973. Source: OSTI; NTIS; GPO Dep.

The Notre Dame Radiation Laboratory is a facility of the Department of Energy operated for the DOE by the University of Notre Dame under contract No. DE-AC02-76ER00038. This quarterly report summarizes the progress on the programs within the Laboratory for the period of October 1, 193 through December 31, 1993. The activities of the staff during this period are noted. A list of publications is presented. A listing and a brief description of each of the reports issued during this quarter are provided.

12692 (INIS-BR–3283) **Study of irradiation effects with electron beam over chloro sulfonate polyethylene.** D'Almeida Andrade, L. (Sao Paulo Univ., SP (Brazil). Inst. de Fisica); Amaral, L.Q. do; Fernandes, E.G. Associacao Brasileira de Polimeros, Sao Paulo, SP (Brazil). 1991. 5p. (In Portuguese). (CONF-9111280–: 1. Brazilian Congress on Polymers, Sao Paulo (Brazil), 5-7 Nov 1991). Order Number DE94620394. Source: OSTI; NTIS (US Sales Only); INIS.

Thermo analytical methods and x-ray diffraction were used to study electron irradiated chloro sulfonate polyethylene platelets. The beam energy was 0,65 MeV and the dose rate did not exceed 2,5 Mrad. With increase of the dose the samples got a yellowish color. For doses between 5 and 15 Mrad the polymer showed changes in its behaviour which were compatible with the curing dose used in industry. (author).

12693 (IPEN-PUB–381) **Treatment of toxic gases SO_2 and NO_x by electron beam irradiation.** Castro Rubio Poli, D. de; Vieira, J.M.; Campos, C.A. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). Jan 1993. 13p. (In Portuguese). Order Number DE94615424. Source: OSTI; NTIS (US Sales Only); INIS.

The removal of S O_2 and N O_x by electron beam irradiation will be studied using a small scale flow system which is being set up in order to obtain basic data for the process technical and economical feasibility concerning industrial applications. The gas irradiation will be performed using a Electron Beam Accelerator with 1,5 MeV power, 25 m A current from Radiation Dynamics, Inc. USA. (author).

4007 Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 11713, 11736, 11763, 11783, 13155, 13156, 13157, 13304

12694 (BARC–1993/E/013) **Recovery of plutonium from oxalate bearing solutions using a mixture of CMPO and TBP.** Mathur, J.N. (Bhabha Atomic Research Centre, Bombay (India). Radiochemistry Div.); Murali, M.S.; Rizvi, G.H.; Iyer, R.H.; Badheka, L.P.; Banerji, A.; Michael, K.M.; Kapoor, S.C.; Dhumwad, R.K. Bhabha Atomic Research Centre, Bombay (India). 1993. 30p. Order Number DE94615378. Source: OSTI; NTIS (US Sales Only); INIS.

A simple and efficient procedure has been developed to quantitatively recover Pu from oxalate bearing solutions using a mixture of octyl(phenyl)-N,N-diisobutylcarbamoylmethylphosphine oxide (CMPO) and TBP in dodecane. Pu(IV) in the range of 6.9 to 34.6 mg/1 was quantitatively extracted into 0.2 M CMPO+ 1.2 M TBP in dodecane from an aqueous solution containing 3.0 M HNO_3 and 0.1 M $H_2C_2O_4$. At such low concentrations of Pu, the distribution ratio (D) did not change but the increase in oxalic acid concentration drastically reduced these values. The variation in HNO_3 concentration at a fixed concentration of 0.2 M CMPO + 1.2 M TBP has shown a dramatic increase in the D values, being 0.3 at 1.0 M and $> 10^4$ at 7.5 M. The extraction was almost quantitative even at the aqueous to organic ratio of 10:1. Plutonium could be quantitatively recovered (i) by stripping with 0.5 M acetic acid and (ii) by coprecipitating it directly from the organic phase with 0.3 M oxalic acid + 0.3 M calcium nitrate + sodium nitrite. $\approx$ 92% of the Pu was found in the precipitate and $\approx$7% in the supernatant. Using this procedure Pu, in a concentrated form ($\approx$50 times), could be recovered from the oxalate bearing solutions without recourse to the destruction of oxalate ion. The slope of 2 from the nitrate ion as well as CMPO variation experiments suggest the species in the organic phase to be $PuC_2O_4(NO_3)_2.2CMPO$. The absorption spectral study of Pu(IV) confirmed the above species in the organic phase. (author). 19 refs., 5 figs., 9 tabs.

12695 (CFFTP-G–9198) **Tritium sorption on protective coatings for concrete.** Miller, J.M. (Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.); Senohrabek, J.A.; Allsop, P.A. Canadian Fusion Fuels Technology Project, Toronto, ON (Canada). Nov 1992. 29p. (AECL–10707.). Order Number DE94612870. Source: OSTI; NTIS (US Sales Only); INIS.

Because of high adsorption of tritium on unprotected concrete, a program to examine effectiveness of various concrete coatings and sealants in reducing tritium sorption was undertaken and various exposure conditions examined. Coatings of epoxy, polyurethane,

bituminous sealant, bituminous sealant covered with polyvinylidene chloride wrap, alkyd paint, and sodium silicate were investigated with tritium (HTO) vapor concentration, humidity and contact time being varied. Exposure to HT was also carried out, and effect of humidity on tritium desorption rate was investigated. Relative effectiveness of coatings was on the order: bituminous sealant + wrap > bituminous sealant > solvent-based epoxy > 100%-solids epoxy > alkyd paint > sodium silicate. Commercially available coatings for concrete resulted in tritium sorption being reduced to < 7% of unprotected concrete. This was improved to ≈0.1% with use of Saran wrap (polyvinylidene chloride). Amount of tritium sorbed was proportional to tritium concentration. Total tritium sorbed decreased with humidity. A saturation effect was observed with increasing exposure time for both coated and unprotected samples. Under test conditions, complete saturation was not achieved within the maximum 8-hour contact time, except for the solvent-based epoxy. The desorption rate increased with a higher-humidity air purge stream. HT desorbed more rapidly than HTO, but amount sorbed was smaller. The experimental program showed that HTO sorption by concrete can be significantly reduced with the proper choice of coating. However, tritium sorption on concrete and proposed coatings will continue to be a concern until the effects of the various conditions that affect the adsorption and desorption of tritium are firmly established for both chronic and acute tritium release conditions. Material sorption characteristics must also be considered in determining enclosure clean-up times, air detritiation system performance, and (Abstract Truncated).

12696 (FZR–93-04) **Operation results and investigations on decommissioning of the molybdenum-99 production plant Rossendorf - AMOR-I.** Bernhard, G. (ed.) (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany)); Friedrich, H.; Boessert, W. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Jan 1993. 78p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02S7370. Order Number DE94752365. Source: OSTI; NTIS (US Sales Only); INIS.

Original fuel elements of a research reactor were reprocessed for fission molybdenum production in the facility AMOR-I. In a 10 years operation $8.5*10^{15}$ Bq Mo-99 were produced in more than 400 runs. The production results and many experiences were described in this report. Further a view is given on the strategy of decommissioning. There are shown results of fission product adsorption on and desorption from material surfaces. Possibilities of decontamination are described. The simultaneous effect of corrosion and radioactive radiation on different materials is discussed. This paper is a basis of the licence procedure for decommissioning of the AMOR-I-plant. (orig./HP)

12697 (HW–61565-RD) **The continuous chlorination of plutonium dioxide.** Rasmussen, M.J. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 14 Aug 1959. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94003754. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Previous reports on the chlorination of plutonium dioxide describe numerous small-scale experiments and a few fair-sized batch preparations. The chemistry of chlorination by numerous reagents is covered, but no process had received sufficient study for large-scale preparation of anhydrous plutonium trichloride. The literature search revealed no extensive studies on chlorination rates, exhaust gas filtering, atmospheric requirements, reactor materials, etc. A program was undertaken to select a chlorination process, to develop the necessary information for defining operating conditions and equipment specifications, and then to demonstrate the operation of the process.

12698 (INP–1505/C) **High-temperature method of rapid separation of In-111 from irradiated silver targets.** Mazgaj, Z. (Institute of Nuclear Physics, Cracow (Poland)); Kolaczkowski, A.; Mikulski, J.; Novgorodov, A.F.; Zielinski, A. Institute of Nuclear Physics, Cracow (Poland). 1990. 10p. Order Number DE94615380. Source: OSTI; NTIS (US Sales Only); INIS.

A high-temperature method of separation of In-111 from α-particle activated silver targets was developed. The separation is carried out under reduced pressure, in the atmosphere of HCl and H_2O vapours. Indium-111, adsorbed on a quartz collector, is washed out quantitatively with 0.1 N HCl. The contaminant, Cd-109 (product of decay of In-109), is removed from the preparation by means of ion-exchange chromatography. 4 tabs., 6 refs. (author).

12699 (INP–1610/C) **Method of thermal separation of ^{211}At from the alpha-particle activated Bi_2O_3 target.** Mazgaj, Z.; Mikulski, J. Institute of Nuclear Physics, Cracow (Poland). 1992. 7p. Grant 20259101. Order Number DE94615381. Source: OSTI; NTIS (US Sales Only); INIS.

Astatine-211 ($t_{1/2}$=7.2 h), produced in the ^{209}Bi(α,2n) reaction, was thermally separated from the irradiated bismuth trioxide target. The separation time did not exceed 1 hour from the EOB. The temperature dependence of the separation yield has been determined. 5 figs., 7 refs. (author).

12700 (IPEN-PUB–390) **A study of thallium-201 preparation at IPEN-CNEN/SP.** Fernandes, L.; Yanagawa, S.T.I.; Mengatti, J.; Nakanishi, C.; Acar, M.E.D. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). May 1993. 13p. (In Portuguese). (CONF-9211275–: 1. National Forum of Science and Technology on Health, Caxambu (Brazil), 20-24 Nov 1992). Order Number DE94615382. Source: OSTI; NTIS (US Sales Only); INIS.

^{201}Tl was obtained in cyclotron by irradiating natural targets of mercury and of thallium with protons. A study of thallium 201 preparation methods was made, since the targets preparation, the chemical separation techniques, until the quality controls of the ^{201}T L C L final solution and the thallium recovery experiments. The results showed in both the thallium preparation methods (direct and indirect) permit to conclude that is is impossible to produce ^{201}T L at IPEN. (author).

4008 Combustion, Pyrolysis, and High-Temperature Chemistry

Refer also to citation(s) 11780, 13862

12701 (ANL/CHM/CP–81151) **Thermal decomposition studies of chlorocarbon molecules in a shock tube using the Cl-atom ARAS method.** Lim, K.P.; Michael, J.V. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–17: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006833. Source: OSTI; NTIS; GPO Dep.

Because of needs for understanding the chemical kinetic mechanism in chlorocarbon molecule incineration, we have recently completed studies on the thermal decompositions of $COCl_2$, CH_3Cl, CH_2Cl_2, CCl_4, and CF_3 Cl. The shock tube technique combined with atomic resonance absorption spectrometry (ARAS), as applied to Cl atoms, has been used to obtain absolute rate data for these reactions. In all cases, the decompositions are nearly in the second-order regime. Theoretical calculations, using the Troe formalism, have been performed. In these calculations, both the threshold energies for decomposition, E_o, and the energy transferred per down collision, ΔE_{down}, are varied parametrically for best fitting to the data. The latter quantity determines the collisional deactivation efficiency factor, β_c.

12702 (ANL/CHM/CP–81226) **High-temperature study of O + H_2CO → OH + HCO.** Hessler, J.P. (Argonne National Lab., IL (United States)); Du, Hong; Ogren, P.J. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940301–9: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE94006837. Source: OSTI; NTIS; GPO Dep.

In our previous studies of the reactions of the methyl radical with molecular oxygen, we noticed that after the methyl radical has been consumed the reactions which control the concentration of hydroxyl are hydroxyl-hydroxyl recombination, the titled reaction, and the reaction between hydroxyl and formaldehyde. From the long-time temporal behavior of hydroxyl we have been able to extract the rate coefficient for the titled reaction over the temperature

range 1580 to 2250 K. When we combine our data with the low temperature data of Klemm et al [J. Chem. Phys. 1980, 72, 1256–1264] we obtain the rate expression $k(T) = 2.59 \times 10^{-16}\ T^{1.67}\ \exp(-891/T(K))\ cm^3 s^{-1}$. This result is consistent with the earlier recommendation of Herron [J. Phys. Chem. Ref. Data 1988, 17, 967–1026] which is based on a Bond-Energy-Band-Order calculation adjusted to agree with the experimental results at 700 K.

12703 (ANL/CHM/PP–75156) **Rate coefficient for the reaction $H + O_2 \rightarrow OH + O$: Results from 2000 to 5300 K.** Hessler, J.P.; Du, Hong. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008105. Source: OSTI; NTIS; GPO Dep.

Tunable-laser flash-absorption has recently provided an unprecedented extension of the temperature range over which the rate of the reaction $H + O_2 \rightarrow OH + O$ has been measured, resolving an 18-year-old controversy over the high-temperature behavior of the rate of the most important reaction in combustion. Studies have shown that the rate of the above reaction follows a simple Arrhenius expression, $k(T) = 1.62 \times 10^{-10} \exp[-7474/T(K)]\ cm^3\ s^{-1}$, from 960 to 5300 K. Previously, measurements by one group extended only up to 3300 K. At 2600 K, the highest temperature studied by three other groups, the measured rates differed by 220%. To obtain the new results, a shock wave was used to quickly heat a sample and the rate of production of OH directly behind the shock wave was measured by tuning the wavelength of a pulsed dye laser to a region of strong absorption by the OH molecule. The strength of this absorption was measured as a function of distance behind the shock wave by directing the light from the laser beam onto a linear-array detector. This technique is capable of measuring the rates of very fast reactions, and is ideal for precise studies at very high temperatures where the rates of chemical reactions are the fastest.

12704 (ANL/CHM/PP–76968) **Photoionization studies of organosulfur transient species.** Ruscic, B.; Berkowitz, J. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008140. Source: OSTI; NTIS; GPO Dep.

Photoionization mass spectrometric studies of the transient species CH_2SH, CH_3S, CH_2S, and HCS have established the heats of formation of these species and their cations, thereby resolving a serious discrepancy between other recent experiments and ab initio calculations in favor of the latter. The isomers CH_2SH (CD_2SH) and CH_3S (CD_3S) were prepared in situ by reaction of F atoms with CH_3SH (CD_3SH). Similar successive abstractions, as well as pyrolysis of suitable precursors, were used to generate CH_2S and HCS. The adiabatic ionization potentials obtained, together with relevant appearance potentials and some auxiliary data, were sufficient to establish the heats of formation for the cited species. Together with confirmatory data obtained from dissociative ionization of CH_3SSCH_3 into various fragments, thermochemical properties of these important intermediates occurring in the combustion of sulfur-containing hydrocarbon fuels were derived.

12705 (DOE/ER/13480–4) **Analysis of forward and inverse problems in chemical dynamics and spectroscopy: Progress performance report, November 1, 1992–October 31, 1993.** Rabitz, H. Princeton Univ., NJ (United States). Dept. of Chemistry. [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13480. Order Number DE94007607. Source: OSTI; NTIS; GPO Dep.

During the past year, progress was made in exploring the relation of between chemical mechanisms and resultant combustion behavior, and the relation between potential surface features and dynamical observables. The first category of study also included theory of lumping or simplification of complex kinetic mechanisms. A systematic approach is being developed understanding and practical execution of kinetic models, including with transport In the second area of research on potential surfaces, we are exploring forward analysis of how potential features influence laboratory observable cross sections and rate constants, as well as development of inverse analysis algorithms. In the latter category, considerable progress has been made on developing an algorithm which is stable and capable of reliably inverting high resolution laboratory spectroscopic data back to intramolecular potentials. A collaboration is under way in this case, with the laboratory program of Marsha Lester, and preliminary results indicate that high quality potential surfaces can be extracted in this fashion.

12706 (DOE/ER/14053–T4) **Combustion-related studies using weakly-bonded complexes.** Beaudet, R.A. University of Southern California, Los Angeles, CA (United States). Dept. of Chemistry. 10 Apr 1990. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-89ER14053. Order Number DE94006631. Source: OSTI; NTIS; GPO Dep.

Objectives are to study binary complexes involving molecular oxygen and the photoinitiated reactions, and to study species involving oxygen atoms and small molecules and simple hydrocarbons. Attempts were made to produce $O(^3P)$ in a jet by photodissociation of NO_2 and to cluster it with HCl. A new pulsed jet vacuum system with greater sensitivity is being constructed. The IR spectrum of O_2DCl complex was measured.

12707 (DOE/PC/92539–5) **Volatiles combustion in fluidized beds: Quarterly technical progress report, September 4, 1993–December 3, 1993.** Hesketh, R.P.; Pendergrass, R.A. Tulsa Univ., OK (United States). Dept. of Chemical Engineering. [1993]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92539. Order Number DE94008382. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to investigate the conditions in which volatiles will burn within both the dense and freeboard regions of fluidized beds. Experiments using a fluidized bed operated at incipient fluidization will be performed to characterize the effect of particle surface area, initial fuel concentration, and particle type on the inhibition of volatiles within a fluidized bed. The work conducted during the period 4 September, 1993 through 3 December, 1993 is reported in this technical progress report. The experimental work during this time period consists primarily of reactor start-up and data collection. Results of stoichiometric combustion of propane in air at three temperatures and a residence time of approximately 3 s are reported. The results of a detailed chemical kinetic model of propane and methane are reported for the theoretical work for this quarter. These results give further evidence that the inhibition of propane and methane combustion is caused by the sand particles.

12708 (SAND–94-8524) **The decomposition of methyltrichlorosilane: Studies in a high-temperature flow reactor.** Allendorf, M.D.; Osterheld, T.H.; Melius, C.F. Sandia National Labs., Livermore, CA (United States). Jan 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. (CONF-931256–1: Materials Research Society (MRS) meeting on gas-phase and surface chemistry in electronics materials processing, Boston, MA (United States), Dec 1993). Order Number DE94006676. Source: OSTI; NTIS; GPO Dep.

Experimental measurements of the decomposition of methyltrichlorosilane (MTS), a common silicon carbide precursor, in a high-temperature flow reactor are presented. The results indicate that methane and hydrogen chloride are major products of the decomposition. No chlorinated silane products were observed. Hydrogen carrier gas was found to increase the rate of MTS decomposition. The observations suggest a radical-chain mechanism for the decomposition. The implications for silicon carbide chemical vapor deposition are discussed.

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Refer also to citation(s) 13324

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 11595, 11610, 11612, 11613, 11615, 11616, 11617, 11618, 11619, 11621, 11650, 11654, 11683, 11737, 11743, 11744, 11746, 11747, 11748, 11749, 11824, 11845, 11847, 11883, 12167, 12253, 12280, 12409, 12696, 12781, 12784, 13012, 13325, 13329, 14244, 14269

12709 (ANL/CHM/PP–76144) **A new method for infrared imaging of air currents in and around critical hazard fume hoods.** Mulac, W.A. (Argonne National Lab., IL (United States)); McCreary, J.R.; Schmalz, H. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008131. Source: OSTI; NTIS; GPO Dep.

Active, safe real-time method of measuring and recording the efficacy of vapor containment in and around critical hazard fume hoods has been developed. An infrared camera whose response is restricted to a spectral range that overlaps a strong absorption band in a nontoxic gas is used to render real-time video images of the presence and flow of the gas. The gas, nitrous oxide, is ejected in a continuous stream in and around fume hoods that are to be certified capable of containing hazardous fumes. The principal advantage is that various scenarios of air flow displacement in and outside the hood can be easily investigated; the principal limitation is the necessity of high tracer gas concentration to obtain strong visualizations.

12710 (BARC–1993/E/016) **A database to evaluate stress intensity factors of elbows with throughwall flaws under combined internal pressure and bending moment.** Chattopadhyay, J. (Bhabha Atomic Research Centre, Bombay (India). Reactor Design and Development Group); Dutta, B.K.; Kushwaha, H.S.; Mahajan, S.C.; Kakodkar, A. Bhabha Atomic Research Centre, Bombay (India). 1993. 24p. Order Number DE94616106. Source: OSTI; NTIS (US Sales Only); INIS.

The advent of Leak-Before-Break (LBB) concept has replaced the traditional design basis event of Double Ended Guillotine Break (DEGB) in the design of primary heat transport (PHT) piping. The use of LBB concept requires postulation of largest credible cracks at highly stressed locations and demonstration of its stability under the maximum credible loading conditions. Stress analysis of PHT piping in nuclear power plants shows that the highly stressed piping components are normally elbows and branch tees. This necessitates detailed fracture mechanics evaluation of piping connections by computing Stress Intensity Factor (SIF) and/or J-integral. Simple analytical solutions for evaluation of SIF and J-integral for cracks in straight pipes are readily available in literature. However, the same type of solutions for elbows and tees are limited in open literature. In the present work, a database is generated to evaluate SIF for throughwall circumferential and longitudinal cracks under combined internal pressure and bending moment. Different parameters to characterise a cracked elbow are pipe factor (h), pipe bore radius to thickness ratio (r/t) and crack length. Another parameter (σ) is used to consider the relative magnitude of stresses due to internal pressure and remote bending moment. The database has been used to derive closed form expressions to evaluate SIF for elbow with cracks in terms of the aforementioned parameters. (author). 8 refs., 12 figs., 3 tabs.

12711 (CONF-9310167–6) **Characterization of explosive devices in luggage: Initial results of the ART-IIC test series.** Akerman, M.A. (Oak Ridge National Lab., TN (United States)); Kass, M.D.; Clough, B.T. Oak Ridge National Lab., TN (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States);Federal Aviation Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. From 64. shock and vibration symposium; Ft. Walton Beach, FL (United States); 25-28 Oct 1993. Order Number DE94007214. Source: OSTI; NTIS; GPO Dep.

Characteristics and damage associated with exploded luggage aboard aircraft are presented in this paper. Plastic-sided suitcases filled with typical travel possessions were exploded inside the fuselage of decomissioned B-52 aircraft. Multilayered shield panels, mounted to one side of the fuselage, served to protect the aircraft body and flight system components from both the blast wave and exploded fragments. The resulting damage produced by the explosions was characterized and the absorbing characteristics of the shielding were evaluated. In addition, the energy of the luggage fragments was estimated.

12712 (CONF-940550–6) **Graphical representation of robot grasping quality measures.** Varma, V. (Oak Ridge National Lab., TN (United States)); Tasch, U. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994. Order Number DE94002189. Source: OSTI; NTIS; GPO Dep.

When an object is held by a multi-fingered hand, the values of the contact forces can be multivalued. An objective function, when used in conjunction with the frictional and geometric constraints of the grasp, can however, give a unique set of finger force values. The selection of the objective function in determining the finger forces is dependent on the type of grasp required, the material properties of the object, and the limitations of the robot fingers. In this paper several optimization functions are studied and their merits highlighted. A graphical representation of the finger force values and the objective function is introduced that enable one in selecting and comparing various grasping configurations. The impending motion of the object at different torque and finger force values are determined by observing the normalized coefficient of friction plots.

12713 (CONF-940550–8) **Input shaping filter methods for the control of structurally flexible, long-reach manipulators.** Kwon, Dong-Soo; Hwang, Dong-Hwan; Babcock, S.M.; Burks, B.L. Oak Ridge National Lab., TN (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States);Korea Science and Engineering Foundation (Korea, Republic of). DOE Contract AC05-84OR21400. From Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994. Order Number DE94002799. Source: OSTI; NTIS; INIS; GPO Dep.

Within the Environmental Restoration and Waste Management Program of the US Department of Energy, the remediation of single-shell radioactive waste storage tanks is one of the areas that challenge state-of-the-art equipment and methods. Concepts that utilize long-reach manipulators are being seriously considered for this task. Due to high payload capacity and high length-to-cross-section ratio requirements, these long-reach manipulator systems are expected to exhibit significant structural flexibility. To avoid structural vibrations during operation, various types of shaping filter methods have been investigated. A robust notch filtering method and an impulse shaping method were used as simulation benchmarks. In addition to that, two very different approaches have been developed and compared. One new approach, referred to as a "feedforward simulation filter," uses imbedded simulation with complete knowledge of the system dynamics. The other approach, "fuzzy shaping method," employs a fuzzy logic method to modify the joint trajectory from the desired end-position trajectory without precise knowledge of the system dynamics.

12714 (CONF-940550–10) **A new solution method for the inverse kinematic joint velocity calculations of redundant manipulators.** Pin, F.G.; Belmans, P.F.R.; Culioli, J.C.; Carlson, D.D.; Tulloch, F.A. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-76OR00033. From Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994. Order Number DE94004427. Source: OSTI; NTIS; GPO Dep.

A new analytical method to resolve underspecified systems of algebraic equations is presented. The method is referred to as the Full Space Parameterization (FSP) method and utilizes easily- calculated projected solution vectors to generate the entire space of solutions of the underspecified system. Analytic parameterizations for both the space of solutions and the null space of the system reduce the determination of a task-requirement-based single solution to a $m - n$ dimensional problem, where $m - n$ is the degree of underspecification, or degree of redundancy, of the system. An analytical solution is presented to directly calculate the least-norm solution from the parameterized space and the results are compared to solutions of the standard pseudo-inverse algorithm which embodies the (least-norm) Moore-Penrose generalized inverse. Application of the new solution method to a variety of systems and task requirements are discussed and sample results using four-link planar manipulators with one or two degrees of redundancy and a seven degree-of-freedom manipulator with one or four degrees of

redundancy are presented to illustrate the efficiency of the new FSP method and algorithm.

12715 (DOE/FTR–94003539) **Travel to Mexico to attend the semi-annual Supplier Quality Partnership meeting: Foreign trip report, October 18–20, 1993.** Gist, W.W.; Hernandez, B.; Swanson, H.W.; Duarte, R.A. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. 22 Oct 1993. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE94003539. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Purpose of the trip to Mexicali, Mexico, was to review Vanguard's manufacturing procedures and processes for the M5, toroid line of devices. The product line produces the 444275, SA3803, and the 412557, SA3795 toroid inductors having WR applications. Procedures audited were the in-process inspection of windings, welds setup and approval, solder stripping of wire insulation and the chip inductor welding process.

12716 (EGG-WTD–10895) **Full-scale retrieval of simulated buried transuranic waste.** Valentich, D.J. (EG and G Idaho, Inc., Idaho Falls, ID (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States); Caterpillar, Inc., Peoria, IL (United States); Martin Marietta Corp., Baltimore, MD (United States). Sep 1993. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94002847. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of a field test conducted to determine the effectiveness of using conventional type construction equipment for the retrieval of buried transuranic (TRU) waste. A cold (nonhazardous and nonradioactive) test pit (1,100 yd^3 volume) was constructed with boxes and drums filled with simulated waste materials, such as metal, plastic, wood, concrete, and sludge. Large objects, including truck beds, tanks, vaults, pipes, and beams, were also placed in the pit. These materials were intended to simulate the type of wastes found in TRU buried waste pits and trenches. A series of commercially available equipment items, such as excavators and tracked loaders outfitted with different end effectors, were used to remove the simulated waste. Work was performed from both the abovegrade and belowgrade positions. During the demonstration, a number of observations, measurements, and analyses were performed to determine which equipment was the most effective in removing the waste. The retrieval rates for the various excavation techniques were recorded. The inherent dust control capabilities of the excavation methods used were observed. The feasibility of teleoperating reading equipment was also addressed.

12717 (ES/ER/TM–101) **Norfolk Southern boxcar blocking/bracing plan for the mixed waste disposal initiative project: Environmental Restoration Program.** Seigler, R.S. Oak Ridge K-25 Site, TN (United States). Jan 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007919. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's (DOE) Environmental Restoration and Waste Management programs will dispose of mixed waste no longer deemed useful. This project is one of the initial activities used to help meet this goal. The project will transport the ~46,000 drums of existing stabilized mixed waste located at the Oak Ridge K-25 Site and presently stored in the K-31 and K-33 buildings to an off-site commercially licensed and permitted mixed waste disposal facility. Shipping and disposal of all ~46,000 pond waste drums (~1,000,000 ft^3 or 55,000 tons) is scheduled to occur over a period of ~5–10 years. The first shipment of stabilized pond waste should transpire some time during the second quarter of FY 1994. Martin Marietta Energy Systems, Inc., proposes to line each of the Norfolk Southern boxcars with a prefabricated, white, 15-mm low-density polyethylene (LDPE) liner material. To avoid damaging the bottom of the polyethylene floor liner, a minimum .5 in. plywood will be nailed to the boxcars' nailable metal floor. At the end of the Mixed Waste Disposal Initiative (MWDI) Project workers at the Envirocare facility will dismantle and dispose of all the polyethylene liner and plywood materials. Envirocare of Utah, Inc., located in Clive, Utah, will perform a health physic survey and chemically and radiologically decontaminate, if necessary, each of the rail boxcars prior to them being released back to Energy Systems. Energy Systems will also perform a health physic survey and chemically and radiologically decontaminate, if necessary, each of the rail boxcars prior to them being released back to Norfolk Southern Railroad.

12718 (ETDE-IT–94-10) **Main design parameters of Italian experimental facility fume sampling and analysis.** Picini, P. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Galuppi, G.; Lombardi, C. No corporate text available. 1993. 6p. (CONF-9303262–1: 2. EUREKA industrial laser safety forum 1993, Coventry (United Kingdom), 28-30 Mar 1993). Order Number DE94752511. Source: OSTI; NTIS (US Sales Only).

The kind and quantity of fumes arising from high temperature processes depend on several parameters and their combination. Materials, surface impurities, thickness, laser type, laser machine parameters, laser power, processing velocities, gas shielding and flow rate are only some of the parameters that strongly influence the type and quantity of fume emissions. Moreover, fume extraction plant layout, flow rate, and emission sampling and analysis methods, can affect the measurement results. Individual Governmental Organizations, ENEA (Italian Agency for New Technologies, Energy and the Environment) AMB and ENEA INN, and Private Industries (FIAT CRF, RTM and CISE) will carry out measurements to characterize fumes each using their own system of fumes generation, extraction, sampling and analysis, it is therefore necessary that the experimental facilities are as similar as possible in order to obtain sufficiently comparable results The general aim of the work presented here is to define the main design specifications of the experimental facility and, according to Italian Standards, the fumes sampling and analysis methods.

12719 (ETDE-IT–94-24) **Analysis of free and forced excitation tests of 394 KN isolated structure mock-up.** Serino, G. (Naples Univ. (Italy)); Martelli, A.; Bonacina, G. No corporate text available. 1993. 15p. (CONF-930702–55: 1993 ASME pressure vessel and piping conference, Denver, CO (United States), 25-29 Jul 1993). Order Number DE94752543. Source: OSTI; NTIS (US Sales Only).

At the 1991 ASME-PVP Conference, some first experimental results obtained from static and dynamic tests on high damping steel laminated rubber bearings (Martelli et al., 1991) and from free and forced excitation tests on a 394 kN isolated structure mock-up were presented (Forni et al., 1991). In this paper, the most significant test data are reorganized and discussed in order to assess the suitability of single bearing test results to predict the dynamic response of an isolated structure. Three mathematical models of the single isolator having different levels of approximation are proposed, and their capability to estimate the experimental response of the mock-up is evaluated. It is shown that a non-linear hysteretic model, defined by three rubber parameters only, allows a very good complete simulation of the dynamic behavior of the isolated structure in both free and forced vibration tests. A simpler equivalent linear viscous model permits a good prediction of the peak absolute acceleration and relative displacement values if bearing stiffness and damping parameters are properly selected, and can be used in a response spectrum analysis, but reproduces less exactly the experimental behavior. An equivalent linear hysteretic model represents more correctly the actual rubber damping behavior, but gives results very similar to those obtained through the equivalent linear viscous model because of the practically monofrequencial response of the isolated structure.

12720 (FEMP–2315) **Automated container transportation using self-guided vehicles: Fernald site requirements.** Hazen, F.B. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Sep 1993. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-92OR21972. Order Number DE94007081. Source: OSTI; NTIS; INIS; GPO Dep.

A new opportunity to improve the safety and efficiency of environmental restoration operations, using robotics has emerged from advances in industry, academia, and government labs. Self-Guided Vehicles (SGV's) have recently been developed in industry and early systems have already demonstrated much, though not all, of the functionality necessary to support driverless transportation of waste within and between processing facilities. Improved materials

databases are being developed by at least two DOE remediation sites, the Fernald Environmental Management Project (FEME) in the State of Ohio and the Hanford Complex in the State of Washington. SGV's can be developed that take advantage of the information in these databases and yield improved dispatch, waste tracking, report and shipment documentation. In addition, they will reduce the radiation hazard to workers and the risk of damaging containers through accidental collision. In this document, features of remediation sites that dictate the design of both the individual SGV's and the collective system of SGV's are presented, through the example of the site requirements at Fernald. Some concepts borrowed from the world of manufacturing are explained and then used to develop an integrated, holistic view of the remediation site as a pseudo-factory. Transportation methods at Fernald and anticipated growth in transport demand are analyzed. The new site-wide database under development at Fernald is presented so that advantageous and synergistic links between SGV's and information systems can be analyzed. Details of the SGV development proposed are submitted, and some results of a recently completed state of the art survey for SGV use in this application are also presented.

12721 (HW–28295) **Reactivity of UO_3 produced at HAPO.** Clagett, F. Hanford Works, Richland, WA (United States). 22 May 1953. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006972. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Short communication. URANIUM TRIOXIDE/reactivity; REACTIVITY/measuring methods; HAPO; REACTIVITY; URANIUM TETRAFLUORIDE; STANDARDS; ORGDP; CHEMICAL REACTION KINETICS

12722 (INIS-JP–018, pp. 47-55) **Upgrading spent fuel shipping casks to meet higher burn-up.** Brachet, Y. (Transnucleaire, 75 - Paris (France)); Lemogne, A. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

In order to allow the transportability of high burn-up fuel and of MOX fuel in existing casks, TRANSNUCLEAIRE presents a two-step proven solution: (1) starting from 35/40 GWd/tU and 3.5 % enrichment, casks of the TN 12 family can be upgraded to 40/45 GWd/tU and 4.3 % enrichment by the use high performance baskets. (2) a second step consists in adding neutron shielding to allow transportation of fuel with a burn-up of 45/50 GWd/tU with a standard basket and of 50/55 GWd/tU with a high performance basket. (J.P.N.).

12723 (INIS-JP–018, pp. 171-176) **OECD-NEA criticality working group - a status report and the burnup credit challenge.** Whitesides, G.E. (Oak Ridge National Lab., TN (United States). Computing and Telecommunications Div.). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

A Working Group established by the organization for Economic Co-operation and Development's Nuclear Energy Agency (OECD-NEA), Paris, has examined the validity of computational methods used for calculations that evaluate the nuclear criticality safety issues involved in the storage, handling and transportation of fissile materials. The basic goal of this Working Group is to attempt to define and implement a procedure that can be shown to demonstrate the validity of the various computational methods used to make criticality safety calculations. The current activities of the Working Group involve an effort to establish the validity of computational methods used to evaluate the criticality safety of the storage, handling, and transportation of spent light-water-reactor fuel elements in which one seeks to take credit for the fissile material burnup and/or buildup of fission products. (J.P.N.).

12724 (INIS-JP–018, pp. 177-184) **The convenient Monte Carlo code MULTI-KENO for criticality safety analysis of transport casks.** Osada, K. (Kubota Corp., Osaka (Japan)); Naito, Y.; Okuno, H. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

In criticality safety analysis of transport casks, an infinite array of fuel rods using a homogeneous cell is normally assumed, since the calculation configurations of transport casks are, in many cases, complicated. Criticality calculations are performed with the homogeneous cell. In the case of a transport cask, using the homogeneous cell is not adequate, since there are many fuel rods contacting reflectors in comparison with the total number of fuel rods. We developed a Monte Carlo code MULTI-KENO (Naito et al. 1983) at Japan Atomic Energy Research Institute (JAERI) in 1983. MULTI-KENO was developed to express a configuration exactly without performing the cell calculation by introducing the concept of 'SUPER BOX'. In this paper, we show some features of MUTLI-KENO and an example of calculations by MULTI-KENO. (J.P.N.).

12725 (INIS-JP–018, pp. 465-471) **Safety evaluation of shipping cask for loading 4 PWR spent fuel.** Kang, Hee-Young (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of)); Lee, Heung-Young; Yoon, Jeong-Hyun; Ro, Seung-Gy. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper presents the safety evaluation of the shipping cask to carry 4 PWR spent fuel. The cask has been designed and licensed according to domestic atomic energy law complied with IAEA Safety Series No.6. The cask called KSC-4 was designed to contain 17x17 fuel array with 38,000 MWD/MTU and 3 yrs cooling time. The safety evaluation has been carried out in the field of shielding, thermal, structure and criticality under the normal transport and hypothetical accident conditions. (J.P.N.).

12726 (INIS-JP–018, pp. 472-479) **Development of the GA-4 and GA-9 legal weight truck spent fuel casks.** Grenier, R.M. (General Atomics, San Diego, CA (United States)); Meyer, R.J.; Mings, W.J. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

General Atomics (GA) has designed two new truck casks under contract to the U.S. Department of Energy as part of the Office of Civilian Radioactive Waste Management (OCRWM) Cask System Development Program. The GA-4 and GA-9 Casks, when licensed by the U.S. Nuclear Regulatory Commission, will transport intact spent fuel assemblies from commercial nuclear reactor sites to a monitored retrievable storage facility or permanent repository. (J.P.N.).

12727 (INIS-JP–018, pp. 480-488) **The TN-RAM - a new cask for shipping high activity irradiated hardware.** Neider, T. (Transnuclear, Inc., Hawthorne, NY (United States)); Hanson, A.S. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Transnuclear, Inc. has developed a Type B(U) radioactive material transport packaging designed specifically for the transport of dry, irradiated, non-fuel bearing components (NFBC). The TN-RAM

is a transport cask in the configuration of a right circular cylinder, fabricated from lead and stainless steel, with wood-filled impact limiters attached at both ends. The lead and stainless steel construction of the lid, walls, and bottom provides a shielding effectiveness of approximately 7.1 inches (18 cm) lead equivalent. (J.P.N.).

12728 (INIS-JP–018, pp. 517-524) **System certification: an alternative to package certification?.** Luna, R.E. (Sandia National Labs., Albuquerque, NM (United States)); Jefferson, R.J. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

This paper considers some of the issues associated with the concept of system certification, including: 1. What risk assessment capabilities will be needed to satisfy requirements? 2. What acceptance criteria are appropriate and how will they be placed into regulations in the current public interaction environment? 3. Will relative risk assessments replace comparison with absolute risk standards? 4. What will be the sources of information to quantify the risk reduction effects of non-standard operating environments? 5. Will data be available to quantify package/system behavior in a wide variety of accident environments? 6. Will public demand for involvement in the system certification process be written into the regulation, as has NEPA requirements for some actions by the United States government? (J.P.N.).

12729 (JAERI-M–93-016, pp. 99-105) **Design characteristics of irradiated material examination facility at KAERI.** Ro, Seung-Gy (Korea Atomic Energy Research Inst., Taejeon (Korea, Republic of). Safety and Examination Analysis Div.); Lee, Key-Soon; Hong, Kwon-Pyo. Japan Atomic Energy Research Inst., Tokyo (Japan). Feb 1993. (CONF-9211283–: JAERI-KAERI joint seminar on post irradiation examination, Oarai (Japan), 9-10 Nov 1992). In *Proceedings of the JAERI-KAERI joint seminar on post irradiation examination.* 298p. Order Number DE94727631. Source: OSTI; NTIS; INIS.

Irradiated Material Examination Facility has been designed, and is now under construction and scheduled to go into operation in 1994. The facility which is complementary to the existing post-irradiation examination facility at KAERI will be used to examining mainly the physical and mechanical properties of irradiated nuclear materials. In the facility a large alpha-gamma cell contains a recirculating nitrogen atmosphere and will be employed for future examination of fuel sample with high-burnup and of irradiated MOX fuel. (author).

12730 (JAERI-M–93-171) **A manual for QUICRI, a computer code for simply evaluating nuclear criticality condition data.** Naito, Yoshitaka (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Okuno, Hiroshi; Koyama, Takashi; Osada, Kazuo. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 45p. (In Japanese). Order Number DE94748554. Source: OSTI; NTIS; INIS.

This report is a manual for QUICRI which is a computer code for simply evaluating the effective multiplication factor or criticality dimension of a single unit according to the modified one-group expression. It consists of three subroutines: database handling, calculation of nuclear criticality condition data and figure outputting. It treats simple geometries as spheres, infinitely-long cylinders and infinite slabs, with/without reflector. Input informations are fuel composition, infinite multiplication factors, migration area and diffusion constants depending on the fuel specifications such as plutonium enrichment, uranium and/or plutonium isotope composition, H/(U + Pu) atomic number ratios. (author).

12731 (LA–12664-MS) **Microcomputer glove box feedthrough and installation.** McFarlan, J.T.; Olivas, R.D. Los Alamos National Lab., NM (United States). Nov 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94004474. Source: OSTI; NTIS; GPO Dep.

A feedthrough mechanism for bringing data acquisition and control signals through a glove box wall is described in this paper.

12732 (LA-SUB–94-28) **Packaging and transportation risk management and evaluation plan.** Rhyne, W.R. (H and R Technical Associates, Inc., Oak Ridge, TN (United States)). Los Alamos National Lab., NM (United States); H and R Technical Associates, Inc., Oak Ridge, TN (United States). Sep 1993. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005658. Source: OSTI; NTIS; INIS; GPO Dep.

Shipments of radioactive materials and hazardous chemicals at the Los Alamos National Laboratory (LANL) are governed by a variety of Federal and state regulations, industrial standards, and LANL processes and procedures. Good judgement is exercised in situations that are not covered by regulations. As a result, the safety record for transporting hazardous materials at LANL has been excellent. However, future decisions should be made such that the decision-making process produces a defensible record of the safety of onsite shipments. This report proposes the development of a risk management tool to meet this need. First, the application of quantitative risk analysis methodology to transportation is presented to provide a framework of understanding. Risk analysis definitions, the basic quantitative risk analysis procedure, quantitative methodologies, transportation data bases, and risk presentation techniques are described. Quantitative risk analysis is frequently complex; but simplified approaches can be used as a management tool to make good decisions. Second, a plan to apply the use of risk management principles to the selection of routes, special administrative controls, and containers for hazardous material transportation at LANL is provided. A risk management tool is proposed that can be used by MAT-2 without substantial support from specialized safety and risk analysis personnel, e.g., HS-3. A workbook approach is proposed that can be automated at a later date. The safety of some types of onsite shipments at LANL is not well documented. Documenting that shipments are safe, i.e., present acceptable risks, will likely require elaborate analyses that should be thoroughly reviewed by safety and risk professionals. These detailed analyses are used as benchmarks and as examples for the use of the proposed tool by MAT-2. Once the benchmarks are established, the workbook can be used by MAT-2 to quantify that safety goals are met by similar shipments.

12733 (LA-UR–93-4097) **Benchmark calculations for some Los Alamos oralloy critical experiments.** Los Alamos National Lab., NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940482–2: American Nuclear Society (ANS) topical meeting, Knoxville, TN (United States), 11-15 Apr 1994). Order Number DE94006211. Source: OSTI; NTIS; GPO Dep.

Contains article by Mosteller, R.D., La Bauver, R.J., Krohn, B.J.; Sapir, J.L., and Iverson, J.L.: Detailed reanalysis of a benchmark critical experiment: Water-reflected enriched-uranium sphere.

In late 1976, LANL personnel performed are accurate measurement to determine the critical mass of a sphere of highly enriched uranium (oralloy) when reflected by water. This experiment has been used previously to benchmark the MCNP and KENO Monte Carlo codes. However, these benchmark calculations were performed for idealizations of the experiment and involved significant approximations. In contrast, the analysis reported herein is based on a detailed representation of the actual experiment and a set of recently published isotopic specifications for the sphere. Differences between the results from this study and those from the earlier benchmark calculations are related to specific aspects of those calculations.

12734 (LA-UR–94-595) **Los Alamos Critical Experiments Facility: Quarterly progress report, January 1–March 31, 1993.** Anderson, R.E.; Paternoster, R.R.; Robba, A.A.; Sanchez, R.G.; Butterfield, K.B.; Partain, B.Q.; Malenfant, R.E. Los Alamos National Lab., NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007569. Source: OSTI; NTIS; GPO Dep.

The Los Alamos Critical Experiments Facility (LACEF) is now operating after a lengthy period of shutdown that lasted from November 1989 until June 1991. Since June 1991, the efforts of

the staff have concentrated on bringing the assemblies back to operational status. The facility is fully operational and performing experiments. This progress report nominally covers the second quarter of FY93 (first quarter of calendar year 1993). It has sections on nuclear criticality safety classes, SHEBA II Project, Godiva IV activities, Skua activities, basic neutron physics measurements, etc.

12735 **Underwater manipulator.** Schrum, P.B.; Cohen, G.H. To Dept. of Energy. 1992. U.S. patent application 7-819,244. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-76PN00014. Order Number DE94007360. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a self-contained, waterproof, water-submersible, remote-controlled apparatus provided for manipulating a device, such as an ultrasonic transducer for measuring crack propagation on an underwater specimen undergoing shock testing. The subject manipulator includes metal bellows for transmittal of angular motions without the use of rotating shaft seals or O-rings. Inside the manipulator, a first stepper motor controls angular movement. In the preferred embodiment, the bellows permit the first stepper motor to move an ultrasonic transducer $\pm$ 45 degrees in a first plane and a second bellows permit a second stepper motor to move the transducer $\pm$ 10 degrees in a second plane orthogonal to the first. In addition, an XY motor-driven table provides XY motion.

12736 **Lid heater for glass melter.** Phillips, T.D. To Dept. of Energy. 1992. U.S. patent application 7-820,463. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007358. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a glass melter having a lid electrode for heating the glass melt radiantly. The electrode comprises a series of INCONEL 690 tubes running above the melt across the melter interior and through the melter walls and having nickel cores inside the tubes beginning where the tubes leave the melter interior and nickel connectors to connect the tubes electrically in series. An applied voltage causes the tubes to generate heat of electrical resistance for melting frit injected onto the melt. The cores limit heat generated as the current passes through the walls of the melter. Nickel bus connection to the electrical power supply minimizes heat transfer away from the melter that would occur if standard copper or water-cooled copper connections were used between the supply and the INCONEL 690 heating tubes.

12737 **Vacuum tool manipulator.** Zollinger, W.T. To Dept. of Energy. 1992. U.S. patent application 7-833,216. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007349. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus for manipulating a vacuum hose in a reactor vessel comprising a housing with two opposing openings, an arm carried by the housing and deployable from a stowed position essentially completely within the housing to an extended position where the arm extends through the two openings in a generally horizontal position. The arm preferably has a two-fingered gripping device for gripping the vacuum hose but may carry a different end effector such as a grinding wheel. The fingers are opened and closed by one air cylinder. A second air cylinder extends the device. A third air cylinder within the housing pivotally pulls the opposing end of the arm into the housing via a pivoting member pivotally connected between the third air cylinder shaft and the arm.

12738 **Method and device for disinfecting a toilet bowl.** Almon, A.C. To Dept. of Energy. 1992. Filed date 28 Feb 1992. U.S. patent application 7-843,027. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007339. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method and device for disinfecting a flush toilet. The device is an electrocell mounted in the tank of the toilet, with two wire mesh electrodes immersed in the water in the tank and a battery applying approximately one to two volts of electric potential to the electrodes so that they chemically reduce a portion of the water in the tank to hydrogen peroxide. Then, when the tank is flushed, the peroxide is carried into the bowl where it can kill bacteria.

12739 **Nozzle mixing apparatus.** Mensink, D.L. To Dept. of Energy. 1992. U.S. patent application 7-844,326. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007337. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a nozzle device for causing two fluids to mix together. In particular, a spray nozzle comprise two hollow, concentric housings, an inner housing and an outer housing. The inner housing has a channel formed therethrough for a first fluid. Its outer surface cooperates with the interior surface of the outer housing to define the second channel for a second fluid. The outer surface of the inner housing and the inner surface of the outer housing each carry a plurality of vanes that interleave but do not touch, each vane of one housing being between two vanes of the other housing. The vanes are curved and the inner surface of the outer housing and the outer surface of the inner housing converge to narrow the second channel. The shape of second channel results in a swirling, accelerating second fluid that will impact the first fluid just past the end of the nozzle where mixing will take place.

12740 (RISO-R–712) **Hazard identification based on plant functional modelling.** Rasmussen, B. (Risoe National Laboratory, Roskilde (Denmark)); Whetton, C. Risoe National Lab., Roskilde (Denmark). Systems Analysis. Oct 1993. 71p. Contract STEP-CT90-0085. Order Number DE94618093. Source: OSTI; NTIS; INIS.

A major objective of the present work is to provide means for representing a process plant as a socio-technical system, so as to allow hazard identification at a high level. The method includes technical, human and organisational aspects and is intended to be used for plant level hazard identification so as to identify critical areas and the need for further analysis using existing methods. The first part of the method is the preparation of a plant functional model where a set of plant functions link together hardware, software, operations, work organisation and other safety related aspects of the plant. The basic principle of the functional modelling is that any aspect of the plant can be represented by an object (in the sense that this term is used in computer science) based upon an Intent (or goal); associated with each Intent are Methods, by which the Intent is realized, and Constraints, which limit the Intent. The Methods and Constraints can themselves be treated as objects and decomposed into lower-level Intents (hence the procedure is known as functional decomposition) so giving rise to a hierarchical, object-oriented structure. The plant level hazard identification is carried out on the plant functional model using the Concept Hazard Analysis method. In this, the user will be supported by checklists and keywords and the analysis is structured by pre-defined worksheets. The preparation of the plant functional model and the performance of the hazard identification can be carried out manually or with computer support. (au) (4 tabs., 10 ills., 7 refs.).

12741 (SAND–92-1842) **Use of inelastic design for radioactive material transportation packages.** Heinstein, M.W.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). Dec 1993. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (TTC–1275). Order Number DE94007253. Source: OSTI; NTIS; GPO Dep.

There is much interest within the radioactive material transportation container design community in the use of inelastic analysis. In other industries where inelastic analysis is used in design there is typically an improved knowledge of the capacity of the structure and a more efficient use of material. This report describes the results of a program in which the incentives for inelastic analysis for radioactive material transport container design were investigated to determine if there are similar benefits. Detailed are the elastic and inelastic analyses of two containers subjected to impacts onto a rigid target following a thirty-foot free fall in end-on, side-on, and center-of-gravity- over-corner orientations.

12742 (SAND–93-1526C) **Laser beaming demonstrations to high-orbit satellites.** Lipinski, R.J. (and others); Meister, D.C.; Tucker, S. Sandia National Labs., Albuquerque, NM (United

States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940142–13: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94006354. Source: OSTI; NTIS; GPO Dep.

Laser power beaming to satellites and orbital transfer vehicles requires the accurate pointing of a low-divergence laser beam to its target, whether the target is in the sunlight or the earth's shadow. The Air Force Phillips Laboratory (AFPL) has demonstrated reduction in the image size of stars by a factor of 10 or more by using laser beacons and adaptive optics for atmospheric compensation. This same technology is applicable to reducing the divergence of laser beams propagated from earth to space. A team of Phillips Laboratory, COMSAT Laboratories, and Sandia National Laboratories plans to demonstrate the state of the art in this area with laser-beaming demonstrations to high-orbit satellites. The demonstrations will utilize the 1.5-m diameter telescope with adaptive optics at the AFPL Starfire Optical Range (SOR) and a ruby laser provided by the Air Force and Sandia (1–50 kill and 6 ms at 694.3 nm). The first targets will be corner-cube retro-reflectors left on the moon by the Apollo 11, 14, and 15 landings. We will attempt to use adaptive optics for atmospheric compensation to demonstrate accurate and reliable beam projection with a series of shots over a span of time and shot angle. We will utilize the return signal from the retro-reflectors to help determine the beam diameter on the moon and the variations in pointing accuracy caused by atmospheric tilt. This will be especially challenging because the retro-reflectors will need to be in the lunar shadow to allow detection over background light. If the results from this experiment are encouraging, we will at a later date direct the beam at a COMSAT satellite in geosynchronous orbit as it goes into the shadow of the earth. We will utilize an onboard monitor to measure the current generated in the solar panels on the satellite while the beam is present. A threshold irradiance of about 4 W/m^2 on orbit is needed for this demonstration.

12743 (SAND–93-2028C) **A complete algorithm for synthesizing modular fixtures for polygonal parts.** Brost, R.C. (Sandia National Labs., Albuquerque, NM (United States)); Goldberg, K.Y. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-94AL85000. Grant IRI-9123747; Grant DDM-9215362. (CONF-940550–9: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94002932. Source: OSTI; NTIS; GPO Dep.

Commercially-available nuclear fixturing systems typically include a square lattice of tapped and bushed holes with precision locating and clamping elements that can be rigidly attached to the lattice using dowel pins or expanding mandrels. Currently, human expertise is required to synthesize a suitable arrangements of these elements to hold a given part. Besides being time consuming, if the set of alternatives is not systematically explored, the designer may fail to find an acceptable fixture or may settle upon a suboptimal fixture. We consider a class of modular fixtures that prevent a part from translating or rotting in the plane using four point contacts on the part's boundary. These fixtures are based on three round locators, each centered on a lattice point, and one translating clamp. We present an algorithm that accepts a polygonal part shape as input and synthesizes the set of all fixture designs that achieve form closure for the given part. The algorithm also allows the user to specify geometric access constraints on fixtures. If the part has n edges and its maximal diameter is d lattice units, the asymptotic running time of the algorithm is $O(n^5d^5)$. We have implemented the algorithm and present example fixtures that it has synthesized. This implementation includes a metric to rank fixtures based on their ability to resist applied forces. We believe this is the first fixture synthesize algorithm that is complete in the sense that it is guaranteed to find an admissible fixture if one exists. Furthermore, the algorithm is guaranteed to find the optimal fixture, relative to any well-defined quality metric.

12744 (SAND–93-2307C) **A global motion planner for curve-tracing robots.** Hwang, Y.K. (Sandia National Labs., Albuquerque, NM (United States)); Chen, P.C.; Neidigk, D.D.; Maciejewski, A.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940550–1: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94001824. Source: OSTI; NTIS; GPO Dep.

We present a global motion planner for tracing curves in three dimensions with robot manipulator tool frames. This planner generates an efficient motion satisfying three types of constraints; constraints on the tool tip for curve tracing, robot kinematic constraints and robot-link collision constraints. Motions are planned using a global search algorithm and a local planner based on a potential-field approach. This planner can be used with potential-field approach. This planner can be used with any robots including redundant manipulators, and can any robots including redundant manipulators, and can control the trade-offs between its algorithmic completeness and computation time. It can be applied in many robotic tasks such as seam welding, caulking, edge deburrring and chamfering, and is expected to reduce motion programming times from days to minutes.

12745 (SAND–93-2326C) **An efficient hybrid planner in changing environments.** Barbehenn, M. (Sandia National Labs., Albuquerque, NM (United States)); Hutchinson, S.; Chen, P.C. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940550–7: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94002292. Source: OSTI; NTIS; GPO Dep.

In this paper, we present a new hybrid motion planner than is capable of exploiting previous planning episodes when confronted with new planning problems. Our approach is applicable when several (similar) problems are successively posed for the same static environment, or when the environment changes incrementally between planning episodes. At the heart of our system lie two low-level motion planners: a fast, but incomplete planner (which we call LOCAL), and a computationally costly (possibly resolution) complete planner (which we call GLOBAL). When a new planning problem is presented to our planner, a meta-level planner (which we call MANAGER) decomposes the problem into segments that are amenable to solution by LOCAL. This decomposition is made by exploiting a task graph, in which successful planning episodes have been recorded. In cases where the decomposition fails, GLOBAL is invoked. The key to our planner's success is a novel representation of solution trajectories, in which segments of collision-free paths are associated with the boundary of nearby obstacles.

12746 (SAND–93-2333C) **Real-time seam tracking for rocket thrust chamber manufacturing.** Schmitt, D.J. (Sandia National Labs., Albuquerque, NM (United States)); Novak, J.L.; Starr, G.P.; Maslakowski, J.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940550–4: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94002035. Source: OSTI; NTIS; GPO Dep.

A sensor-based control approach for real-time seam tracking of rocket thrust chamber assemblies has been developed to enable automation of a braze paste dispensing process. This approach utilizes a non-contact Multi-Axis Seam Tracking (MAST) sensor to track the seams. Thee MAST sensor measures capacitance variations between the sensor and the workpiece and produces four varying voltages which are read directly into the robot controller. A PID control algorithm which runs at the application program level has been designed based upon a simple dynamic model of the combined robot and sensor plant. The control algorithm acts on the incoming sensor signals in real-time to guide the robot motion

along the seam path. Experiments demonstrate that seams can be tracked at 100 mm/sec within the accuracy required for braze paste dispensing.

12747 (SAND–93-2352C) **An interactive Virtual Reality simulation system for robot control and operator training.** Miner, N.E.; Stansfield, S.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940550–3: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94002040. Source: OSTI; NTIS; GPO Dep.

Robotic systems are often very complex and difficult to operate, especially as multiple robots are integrated to accomplish difficult tasks. In addition, training the operators of these complex robotic systems is time-consuming and costly. In this paper, a virtual reality based robotic control system is presented. The virtual reality system provides a means by which operators can operate, and be trained to operate, complex robotic systems in an intuitive, cost-effective way. Operator interaction with the robotic system is at a high, task-oriented, level. Continuous state monitoring prevents illegal robot actions and provides interactive feedback to the operator and real-time training for novice users.

12748 (SAND–93-2380C) **Whole arm obstacle avoidance for teleoperated robots.** Feddema, J.T.; Novak, J.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940550–5: Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics, San Diego, CA (United States), 8-13 May 1994). Order Number DE94001419. Source: OSTI; NTIS; GPO Dep.

This paper describes a collision avoidance system using Whole Arm Proximity (WHAP) sensors on a PUMA 560 robot arm. The capacitance-based sensors generate electric fields which can completely encompass the robot arm and detect obstacles as they approach from any direction. The directional obstacle information gathered by the WHAP sensors together with the sensor geometry and robot configuration is used to scale the commanded joint velocities of the robot. A linearized relationship between the WHAP sensor reading and the distance from the obstacle allows direct transformation of perturbations in VHAP readings to perturbations in joint velocities. The VHAP reading is used to directly reduce the component of the command input velocity along the normal axis of the sensor, allowing graceful reductions in speed as the arm approaches the obstacle. By scaling only the component of the velocity vector in the,direction of the nearest obstacles, the control system restricts motion in the direction of obstacles while permitting unconstrained motion in other directions.

12749 (SAND–93-2687) **Sandia Technology engineering and science accomplishments.** Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008312. Source: OSTI; NTIS; GPO Dep.

This report briefly discusses the following research being conducted at Sandia Laboratories: Advanced Manufacturing – Sandia technology helps keep US industry in the lead; Microelectronics-Sandia's unique facilities transform research advances into manufacturable products; Energy – Sandia's energy programs focus on strengthening industrial growth and political decisionmaking; Environment – Sandia is a leader in environmentally conscious manufacturing and hazardous waste reduction; Health Care – New biomedical technologies help reduce cost and improve quality of health care; Information & Computation – Sandia aims to help make the information age a reality; Transportation – This new initiative at the Labs will help improve transportation, safety,l efficiency, and economy; Nonproliferation – Dismantlement and arms control are major areas of emphasis at Sandia; and Awards and Patents – Talented, dedicated employees are the backbone of Sandia's success.

12750 (SAND–93-3829C) **An overview of the Accident Response Mobile Manipulation System (ARMMS).** Morse, W.D.; Hayward, D.R.; Jones, D.P.; Sanchez, A.; Shirey, D.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940214–9: Space 94: international conference and exposition on engineering, construction, and operations in space, Albuquerque, NM (United States), 26 Feb - 3 mar 1994). Order Number DE94007914. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a high mobility platform integrated with high strength manipulation is under development at Sandia National Laboratories. The mobility platform used is a High Mobility Multipurpose Wheeled Vehicle (HMMWV). Manipulation is provided by two Titan 7F Schilling manipulators integrated onboard the HMMWV. The current state of development is described and future plans are discussed.

12751 (SAND–94-0123C) **An application reference model for layered manufacturing.** Kennicott, P.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940154–1: International conference on rapid product development, Stuttgart (Germany), 31 Jan 1994). Order Number DE94006368. Source: OSTI; NTIS; GPO Dep.

The Intelligent Manufacturing Systems (IMS) Test Case 6 project (Rapid Product Development) was set up to demonstrate rapid product development and 3D measurement techniques where the agencies performing the work were distributed over different countries. Test Case 6 provided a unique opportunity to examine the process by which an application protocol (AP) of the Standard for Exchange of Product Data is prepared. The test case had a well defined scope, the production of simple parts by means of layered manufacturing techniques. The information concerned with this manufacture was similarly well defined, due to the requirement that the information be transmitted among the organizations participating in the test case. STEP is an international standard specifying the data content and format for storage and exchange of product data throughout the product's life cycle. STEP has been under development since 1984 and is just now emerging as an International Standard. STEP is specified as a series of information models using the EXPRESS computer language. For purposes of data exchange, a mapping to a physical file format is specified. Informally, product data can be defined as all the data about a product which one might wish to save. This definition implies some variation in the amount of data to be saved in any one instance. In the case of Test Case 6, one would certainly wish to save the IGES files describing the part. One may or may not wish to save the manufacturing parameters. While there are many parts of STEP with different purposes, the important series of parts for the purposes of standardizing product data are those dealing with application protocols. An application protocol specifies the details of product data within the context of a single application (in this case, layered manufacturing). Other APs deal with such subjects as configuration-managed solid parts and associated drafting.

12752 (SAND–94-0254C) **Bounds on least-squares four-parameter sine-fit errors due to harmonic distortion and noise.** Deyst, J.P. (National Inst. of Standards and Technology, Gaithersburg, MD (United States)); Souders, T.M.; Solomon, O.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940557–1: Instrumentation and measurement technology conference, Hammamatsu (Japan), 10-12 May 1994). Order Number DE94007859. Source: OSTI; NTIS; GPO Dep.

Least-squares sine-fit algorithms are used extensively in signal processing applications. The parameter estimates produced by such algorithms are subject to both random and systematic errors when the record of input samples consists of a fundamental sine wave corrupted by harmonic distortion or noise. The errors occur because, in general, such sine-fits will incorporate a portion of the harmonic distortion or noise into their estimate of the fundamental. Bounds are developed for these errors for least-squares four-parameter (amplitude, frequency, phase, and offset) sine-fit algorithms. The errors are functions of the number of periods in the record, the number of samples in the record, the harmonic order, and fundamental and harmonic amplitudes and phases. The

bounds do not apply to cases in which harmonic components become aliased.

12753 (SAND–94-8535) **The role of variation, error, and complexity in manufacturing defects.** Hinckley, C.M. (Sandia National Labs., Livermore, CA (United States)); Barkan, P. Sandia National Labs., Livermore, CA (United States). Mar 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94007467. Source: OSTI; NTIS; GPO Dep.

Variation in component properties and dimensions is a widely recognized factor in product defects which can be quantified and controlled by Statistical Process Control methodologies. Our studies have shown, however, that traditional statistical methods are ineffective in characterizing and controlling defects caused by error. The distinction between error and variation becomes increasingly important as the target defect rates approach extremely low values. Motorola data substantiates our thesis that defect rates in the range of several parts per million can only be achieved when traditional methods for controlling variation are combined with methods that specifically focus on eliminating defects due to error. Complexity in the product design, manufacturing processes, or assembly increases the likelihood of defects due to both variation and error. Thus complexity is also a root cause of defects. Until now, the absence of a sound correlation between defects and complexity has obscured the importance of this relationship. We have shown that assembly complexity can be quantified using Design for Assembly (DFA) analysis. High levels of correlation have been found between our complexity measures and defect data covering tens of millions of assembly operations in two widely different industries. The availability of an easily determined measure of complexity, combined with these correlations, permits rapid estimation of the relative defect rates for alternate design concepts. This should prove to be a powerful tool since it can guide design improvement at an early stage when concepts are most readily modified.

12754 (UCRL-ID–116320) **LLNL casting technology.** Shapiro, A.B.; Comfort, W.J. III (eds.). Lawrence Livermore National Lab., CA (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008282. Source: OSTI; NTIS; GPO Dep.

Competition to produce cast parts of higher quality, lower rejection rate, and lower cost is a fundamental factor in the global economy. To gain an edge on foreign competitors, the US casting industry must cut manufacturing costs and reduce the time from design to market. Casting research and development (R&D) are the key to increasing US compentiveness in the casting arena. Lawrence Livermore National Laboratory (LLNL) is the home of a wide range of R&D projects that push the boundaries of state-of-the art casting. LLNL casting expertise and technology include: casting modeling research and development, including numerical simulation of fluid flow, heat transfer, reaction/solidification kinetics, and part distortion with residual stresses; special facilities to cast toxic material; extensive experience casting metals and nonmetals; advanced measurement and instrumentation systems. Department of Energy (DOE) funding provides the leverage for LLNL to collaborate with industrial partners to share this advanced casting expertise and technology. At the same time, collaboration with industrial partners provides LLNL technologists with broader insights into casting industry issues, casting process data, and the collective, experience of industry experts. Casting R&D is also an excellent example of dual-use technology; it is the cornerstone for increasing US industrial competitiveness and minimizing waste nuclear material in weapon component production. Annual funding for casting projects at LLNL is $10M, which represents 1% of the total LLNL budget. Metal casting accounts for about 80% of the funding. Funding is nearly equally divided between development directed toward US industrial competitiveness and weapon component casting.

12755 (UCRL-JC–114041) **SHARP, a first step towards a full sized Jules Verne Launcher.** Bertolini, L.R. (Lawrence Livermore National Lab., CA (United States)); Hunter, J.W.; Powell, J.R.; Tidman, D.A. Lawrence Livermore National Lab., CA (United States). May 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305233–2: 11. high frontier conference on bringing the vision of space into reality, Princeton, NJ (United States), 12 May 1993). Order Number DE94007029. Source: OSTI; NTIS; GPO Dep.

A vital element for space exploration and utilization is the ability to affordably place large quantities of consumables and building material into low earth orbit. Calculations and supportive data indicate this can be done with a large hydrogen gas gun referred to as the Jules Verne Launcher (JVL). We present a design for the JVL based upon the concept of side injecting preheated hydrogen along a long barrel. This dramatically reduces the peak pressures in the launcher as well as the pressures and g-loads at the vehicle. The JVL has the promise of reducing payload delivery costs to Low Earth Orbit (LEO) to below $500/kg. The Super High Altitude Research Project (SHARP) is a conventional two-stage hydrogen gas gun which is configured to launch 5 kg packages on suborbital trajectories. It is the first step towards the much larger Jules Verne system and will demonstrate several important features of the larger system. SHARP is currently in the middle of a series of tests aimed at its first milestone. This is to launch 5 kg at 4 km/sec horizontally. In its inclined configuration SHARP should launch vehicles to apogees in excess of 400 km and ranges in excess of 700 km.

12756 (UCRL-JC–114401) **Near-term feasibility demonstration of laser power beaming.** Friedman, H.W. Lawrence Livermore National Lab., CA (United States). Jan 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940142–16: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007238. Source: OSTI; NTIS; GPO Dep.

A mission to recharge batteries of satellites in geostationary orbits (geosats) may be a commercially viable application which could be achieved with laser systems somewhat larger than present state-of-the-art. The lifetime of batteries on geosats is limited by repetitive discharge cycles which occur when the satellites are eclipsed by the earth during the spring and fall equinoxes. By coupling high power lasers with modern, large aperture telescopes and laser guide star adaptive optics systems, present day communications satellites could be targeted. It is important that a near term demonstration of laser power beaming be accomplished using lasers in the kilowatt range so that issues associated with high average power be addressed. The Laser Guide Star Facility at LLNL has all the necessary subsystems needed for such a near term demonstration, including high power lasers for both the power beam and guide star, beam directors and satellite tracking system.

12757 (UCRL-JC–115950) **Dual-band infrared imaging to detect corrosion damage within airframes and concrete structures.** Del Grande, N.K.; Durbin, P.F. Lawrence Livermore National Lab., CA (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States);Federal Aviation Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. Agreement DTFA03-92-A-00007. (CONF-940483–1: 16. SPIE thermosense: international conference on thermal sensing and imaging and diagnostic applications, Orlando, FL (United States), 4-8 Apr 1994). Order Number DE94006047. Source: OSTI; NTIS; GPO Dep.

We are developing dual-band infrared (DBIR) imaging and detection techniques to inspect air frames and concrete bridge decks for hidden corrosion damage. Using selective DBIR image ratios,, we enhanced surface temperature contrast and removed surface emissivity noise associated with clutter. Our surface temperature maps depicted defect sites, which heat and cool at different rates than their surroundings. Our emissivity-ratio maps tagged and removed the masking effects of surface clutter. For airframe inspections, we used time-resolved DBIR temperature, emissivity-ratio and composite thermal inertia maps to locate corrosion-thinning effects within a flash-heated Boeing 737 airframe. Emissivity-ratio maps tagged and removed clutter sites from uneven paint, dirt and surface markers. Temperature and thermal inertia maps characterized defect sites, types, sizes, thicknesses, thermal properties and material-loss effects from air frame corrosion. For concrete inspections, we mapped DBIR temperature and emissivity-ratio patterns

to better interpret surrogate delamination sites within naturally-heated, concrete slabs and remove the clutter mask from sand pile-up, grease stains, rocks and other surface objects.

12758 (VTT-PUB–133) **Simulation of the effect of wind on clothing by measurements and calculations.** Anttonen, H. (Oulu Regional Institute of Occupational Health (Finland)); Hiltunen, E.; Oesterlund, R. Technical Research Centre of Finland, Espoo (Finland). 1993. 47p. Order Number DE94721999. Source: OSTI; NTIS.

The conventional measuring methods of thermal resistance R_{ct} and water vapour resistance R_{et}, do not give enough information about the function of winter clothing in different conditions. It has been suggested that sweating cylinder measurements could give more useful results especially in a windy environment. In this study two self-constructed cylinders were used, with diameters of 300 and 200 mm, both 500 mm in height. The cylinders were divided either into two 120 deg and two 60 deg sectors, which were controlled together or separately, or into one sector. The cylinder was placed in a wind-tunnel in the climatic chamber where ambient temperature (-15 deg C... +5 deg C) and wind velocity (l...8 m/s) were adjustable. Skin temperature (+35 deg C) and sweating level (0... 120 g/m^{2}h) of the cylinder were controlled by a computer. Different types of multilayer winter clothing were studied by this method The combinations used varied in materials, thickness (3-14 mm) and air permeability (7...177 l/m^{2}s). The effect of wind on heat and mass flow has been described by the developed model. Increase of wind (1...8 m/s) decreased the total thermal resistance by 10...60 % in dry conditions and by 5...40 % in wet conditions. Mass transfer decreased by 0...40 % in cold. The development of measuring method, the theory and the clothing models are under progress, but it is obvious that cylinder measurements are suitable especially in windy conditions.

4204 Heat Transfer and Fluid Flow

Refer also to citation(s) 11514, 11579, 11685, 12151, 12418, 12992

12759 (CEA-CONF–11463) **Simulations of the turbulent wake of a towed or self propelled body in a uniform fluid flow with the TRIO code.** Berthier, J. (CEA Centre d'Etudes de Grenoble, 38 (France). Direction des Technologies Avancees); Blanpain, R.; Villand, M. CEA Centre d'Etudes de Grenoble, 38 (France). Direction des Technologies Avancees. 1993. 7p. (CONF-9309333–: 5. International Symposium on Refined Flow Modelling and Turbulence Measurements, Paris (France), 7-10 Sep 1993). Order Number DE94613604. Source: OSTI; NTIS (US Sales Only); INIS.

STEADY FLOW/t codes; BOUNDARY CONDITIONS; REYNOLDS NUMBER; TURBULENCE; VELOCITY

12760 (DOE/ER/13567–T2) **[Particle dispersion by ordered motion in mixing layers]: [Annual report].** Troutt, T.R. Washington State Univ., Pullman, WA (United States). [1989]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-86ER13567. Order Number DE94004485. Source: OSTI; NTIS; GPO Dep.

Multiphase mixing in turbulent flows is a key element in many practical energy conversion, chemical mixing and pollutant dispersal problems. Numerous important technological and environmental processes could be better addressed with improvements in understanding in this area. Progress in developing understanding of this field, however, has traditionally been difficult because of the complexities involved with the turbulent flows employed to provide the mixing mechanisms. To address this problem from a new perspective several years ago this research group initiated an ongoing investigation concerning the potential connections between organized turbulent vortex structures and the particle dispersion process. This report details activities during this reporting period.

12761 (DOE/FTR–94002463) **Travel to Germany to attend the 44th Aeroballistics Range Association (ARA) meeting: Foreign trip report, September 11, 1993–September 25, 1993.** Chhabildas, L.C.; Stanton, P.L. Sandia National Labs., Albuquerque, NM (United States). 18 Oct 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94002463. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Travel to Germany to attend the 44th Aeroballistics Range Association (ARA) Meeting, Munich, Germany. The ARA meeting was hosted by the Institutfuer Luft und Raumfahrt, Technische Universitaet Muenchen, Munich. During this trip and after the ARA meeting, the authors visited the Ernst Mach Institut (EMI) in Freiburg, and the French Army Research laboratory at Centre d' Etude de Grommet, Grommet, France. these laboratories are actively performing state-of-the-art research on ballistic testing and the dynamic properties of materials, including those of importance to current armor/anti-armor programs at Sandia. They are also among the few labs in the forefront of studies on hypervelocity launcher developments, shock strength, and ballistic impact.

12762 (DOE/FTR–94004044) **Travel to Europe to attend the AGARD Fluid Dynamics Panel Symposium: Foreign trip report, October 2–21, 1993.** Aeschliman, D.P. Sandia National Labs., Albuquerque, NM (United States). 24 Nov 1993. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DP00789. Order Number DE94004044. Source: OSTI; NTIS (US Sales Only); GPO Dep.

All objectives of the foreign travel were achieved, and the planned schedule was maintained. Departure from Albuquerque was on October 2, and return was on October 21.I attended the AGARD Fluid Dynamics Panel Symposium in Brussels the first week. The symposium dealt primarily with wall and sting interferences on models in wind tunnels. The most significant technical conclusions drawn from the conference are that (a) CFD is not capable of accurately predicting these interferences, now and for the foreseeable future, and (b) that the wind tunnel community is just now starting to realize how necessary and difficult it is to accurately assess wall and support interference effects in order to conduct valid CFD code validation experiments, since in general CFD codes assume uniform, unbounded flow, and no support interference. CFD was, however, judged to be a useful tool for correcting experimental measurements, and for predicting trends of data. The meeting was a milestone in that it was the first AGARD meeting to which the Russians were invited to participate.

12763 (EUR–13541, pp. 11-17) **Enhanced evaporation heat transfer surfaces.** Groll, M. (Stuttgart Univ. (Germany). Inst. fuer Kernenergetik und Energiesysteme); Roesler, S. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0041-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

Different techniques to enhance evaporation heat transfer surfaces for heat exchangers in industrial applications shall be experimentally and theoretically investigated in a R and D program involving several partners. Both static and dynamic techniques will be used, i.e. evaporation heat transfer from planar and tubular surfaces in a pool boiling and flow boiling mode, and evaporation heat transfer from rotating surfaces.

12764 (EUR–13541, pp. 19-30) **Improving the performance of shell and tube heat exchangers.** Hesselgreaves, J.E. (National Engineering Lab., East Kilbride (United Kingdom)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0016-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

This paper describes a collaborative research programme aimed at enabling shell and tube heat exchangers such as rod and grid baffles to meet increasing demands for energy efficiency by performing with lower temperature differences. Concepts for improved baffle systems giving higher shell-side heat transfer performance with acceptable pressure drop are also being explored by systematic tests, both in an ideal longitudinal flow facility and in full-size heat exchangers. To enable good matching of shell-side and tube-side performance, in-tube enhancement devices are also tested.

The overall performance with tube and shell-side enhancements is evaluated on the basis of overall exchanger shape and size compared with a conventionally-baffled exchanger with similar tube diameter and pitch.

12765 (EUR–13541, pp. 31-41) **Study of the distribution at the tube-side of the liquid-vapour mixture in a shell and tube heat exchanger.** Lauro, F. (CEA Centre d'Etudes de Grenoble, 38 (France)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. (In French). Contrat JOUE-0039-FR. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

An experimental study and a modelization based on the TRIO code for the simulation with a two-fluid model of a di-phasic flow are presented. The TRIO code is validated with a water-air heat exchanger simulator. An evaporation exchanger will be specially designed for an industrial condition experiment, and will be installed on a 250 kW refrigerating machine operating with R22 refrigerant. Tube mounted sensors will measure the vacuum rate (air volume/total volume local ratio) and the liquid-vapor mixture mass flow rate inside the tubes.

12766 (EUR–13541, pp. 43-57) **Generic studies for industrial heat exchanger fouling.** Isdale, J.D. (National Engineering Lab., East Kilbride (United Kingdom)). Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0040-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The main objective of the program is the development of mathematical models which may be used to predict gas-side exchanger fouling for a range of environments. This involves the identification, assessment and implementation (through computer programs) of a set of equations which describe the transport of material from exhaust gas streams to the exchanger surfaces. Correlations will also be developed which will provide information on the retention of that material by the exchanger surface. Specific effects such as the influence of surface temperature and geometry are quantified. In addition, a practical fouling monitor for non-specialist use will be developed.

12767 (EUR–13541, pp. 113-125) **Fixed bed reactor with integrated heat exchanger.** Heijkoop, G. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE–0019-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

The aim of this study is to integrate heat transfer with (catalytic) reactions for process intensification. In a former research, the basics of a reactor with sinter-metals were developed. In this project, the design and development of an industrial-type application of such a reactor is presented. For this, the super-Claus reaction is chosen and the following steps are implemented in the design methodology: research into a method for varying the voidage of the sinter-metal matrix in order to optimize the design for heat production and transfer as well as determination of the voidage and heat conductivity; determination of the catalyst activity; combination of the above results into a computer model.

12768 (EUR–13541, pp. 129-140) **Absorption-driven multiple effect evaporators.** Yanniotis, S. Commission of the European Communities, Luxembourg (Luxembourg). 1991. JOUE-0010-GR. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

An absorption-driven multiple effect evaporator has been built and operated. The energy savings compared to conventional steam-heated evaporators could range from 30 to 45 pc. A model for a falling film absorber composed of an adiabatic and a diabatic zone has been developed. The 'Height of transfer unit' and 'Number of transfer unit' concepts have been used to size the absorber. A process control system, with a PC-based central controller performing supervisory control and user interface tasks and a remote unit, the control station, performing local control and data acquisition, has been designed.

12769 (EUR–13541, pp. 161-176) **Advanced flow modelling for applications in the process industries.** Markatos, N.C. Commission of the European Communities, Luxembourg (Luxembourg). 1991. Contract JOUE-0067-C. (CONF-9010554–: European seminar on improved energy efficiency in the process industries, Brussels (Belgium), 23-24 Oct 1990). In *Improved energy efficiency in the process industries.* 307p. Order Number DE94749205. Source: OSTI; NTIS (US Sales Only).

This paper describes the project for assessing the utilization of present computational fluid dynamics approaches to predict the performance of spray dryers and packed-bed reactors, for improved energy efficiency systems. It will consists in both experimental and theoretical studies in simplified situations as a first step and, when successful, in a further study where the developed models will be applied to predict the performance of industrial units and to test these predictions against experimental data.

12770 (INIS-mf–13749, pp. 84-85) **Flowfield survey of a radial inflow turbine under pulsating flow conditions using laser-two-focus anemometer.** Baines, N.C. (Imperial Coll. of Science and Technology, London (United Kingdom). Dept. of Mechanical Engineering); Hajilouy-Benisi, A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FLOW RATE/laser doppler anemometers; FLOW RATE/turbines; TURBINES; STEADY FLOW

12771 (INIS-mf–14163) **Representation of critical heat flux in rod bundles.** Bethke, S. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 24 Apr 1992. 201p. (In German). Order Number DE94745991. Source: OSTI; NTIS (US Sales Only); INIS.

Both the transition from the square lattice of a conventional pressurized water reactor to the hexagonal fuel rod pitch of the advanced pressurized water reactor, and the expected high mass flow rates through fuel elements go far beyond the parameter ranges of the thermohydraulic phenomena studied for the PWR. In particular the safety-relevant area of critical heat fluxes requires fresh experimental and theoretical consideration. In the present paper the experiments made by the two institutions were simulated numerically by means of a subchannel analysis, the critical flux was determined and compared with the experimental values. Critical heat flux was determined according to different CHF-correlations or data tables from outlet states of the subchannels, simulating the power transient up to the numerically determined occurrence of critical boiling. The critical heat flux was determined by means of CHF correlations or data charts from the outlet state of the subchannels. The parameters which, in addition to the hydraulic and thermal data, determine the level of the critical heat flux were thoroughly investigated. The most important result of that investigation was a calculation method which enables the application of the circular-tube-CHF-results to rod bundle geometries. To this effect, regulations concerning the calculation of tube diameters are specified with regard to the heat transfer ranges indicated by Boltenko et al., which behave similar to the subchannels and therefore enable the application of circular-tube-CHF results of the charts to rod bundle geometries. In particular, a new, force-related diameter d_k was defined for the entrainment-controlled circular-ring boiling range.

12772 (NEI-NO–387) **Condensation of hydrocarbon mixtures in coil-wound LNG heat exchangers: Tube-side heat transfer and pressure drop.** Neeraas, B.O. Trondheim Univ. (Norway). Norges Tekniske Hoegskole. Sep 1993. 203p. Order Number DE94743506. Source: OSTI; NTIS.

Based on an extensive experimental program, with 250 data points, methods for calculation of local heat-transfer coefficients and frictional pressure drops for tube-side condensation of hydrocarbon mixtures in coil-wound liquefied natural gas (LNG) heat exchangers have been developed. The dimensions of the test exchanger correspond to those of the coil-wound main heat exchangers in base-load LNG plants. Measurements of pure and mixed hydrocarbons in single-phase and condensing two-phase flow, at pressure up to 40 bar and mass flux up to 400 kg/m^{2}s, have been carried out in order to develop these methods. Measurements of R22 have also been accomplished. The effects of mixtures have been studied and, as expected, a reduction in the heat-transfer coefficients compared to corresponding pure components has been observed. The measurements are compared to selected methods from the reference literature. The deviations between the correlations were large. Those correlations which showed the best agreement with the measurements were used as a basis for developing new methods. More complex models based on a theoretical approach are also suggested. 68 refs., 103 figs., 30 tabs.

12773 (SAND–93-2556C) **Parallel particle simulations of low-density fluid flows.** Plimpton, S.; Bartel, T. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940428–2: High performance computing '94: grand challenges in computer simulation, La Jolla, CA (United States), 11-15 Apr 1994). Order Number DE94007858. Source: OSTI; NTIS; GPO Dep.

Direct Simulation Monte Carlo (DSMC) is a simulation technique that uses particles to model fluids at low densities where continuum formulations break down. Monte Carlo rules are used to perform particle collisions and chemical reactions and a grid is used to locate nearby particles. We describe our implementation of a large-scale DSMC model on the thousand-processor nCUBE 2 and Intel Paragon machines. It includes body-fitted irregular grids and particle weighting to reduce the numbers of particles and grid cells that must be used. Our parallel methods for load-balancing and performing irregular communication on the distributed-memory machines are also discussed. The parallel machines have enabled us to run large simulations (10^7 particles, 10^4 grid cells, 10^4 timesteps) at speeds up to 40 times faster (on our nCUBE 2) than on a Cray Y-MP processor. For illustration purposes, we include results from some of these large-scale simulations.

12774 (SAND–93-7072) **THERM3D – A boundary element computer program for transient heat conduction problems.** Ingber, M.S. (New Mexico Univ., Albuquerque, NM (United States). Dept. of Mechanical Engineering). Sandia National Labs., Albuquerque, NM (United States); New Mexico Univ., Albuquerque, NM (United States). Dept. of Mechanical Engineering. Feb 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008112. Source: OSTI; NTIS; GPO Dep.

The computer code THERM3D implements the direct boundary element method (BEM) to solve transient heat conduction problems in arbitrary three-dimensional domains. This particular implementation of the BEM avoids performing time-consuming domain integrations by approximating a "generalized forcing function" in the interior of the domain with the use of radial basis functions. An approximate particular solution is then constructed, and the original problem is transformed into a sequence of Laplace problems. The code is capable of handling a large variety of boundary conditions including isothermal, specified flux, convection, radiation, and combined convection and radiation conditions. The computer code is benchmarked by comparisons with analytic and finite element results.

4205 Materials Testing

Refer also to citation(s) 12583, 12993

12775 (BARC–1993/E/015) **Neutron radiography for quality assurance of PHWR fuel pins.** Chandrasekharan, K.N. (Bhabha Atomic Research Centre, Bombay (India). Radiometallurgy Div.); Patil, B.P.; Ghosh, J.K.; Ganguly, C. Bhabha Atomic Research Centre, Bombay (India). 1993. 14p. Order Number DE94616241. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron radiography was employed for quality assurance (QA) for advanced PHWR experimental fuel pins containing mixed uranium-plutonium dioxide and thorium-plutonium dioxide pellets. Direct, transfer and track-etch techniques were utilised. The thermal neutron beam facility of APSARA research reactor at Bhabha Atomic Research Centre was used. (author). 5 refs., 16 figs., 2 tabs.

12776 (BARC–1993/E/019) **Development of an industrial isotopic tomographic imaging system CITIS-1.** Kumar, U. (Bhabha Atomic Research Centre, Bombay (India). Isotope Div.); Ramakrishnan, G.S.; Datta, S.S.; Dhar, D.C.; Bhattacharyya, P.K. Bhabha Atomic Research Centre, Bombay (India). 1993. 23p. Order Number DE94616242. Source: OSTI; NTIS (US Sales Only); INIS.

The present report describes the development of an industrial isotopic tomographic imaging system for nondestructive testing of industrial specimens on a laboratory scale. The system consisting of a translate-rotate type scanner, a gamma-ray beam generator, a Na(Tl) scintillation detector and associated electronics coupled with a PC/AT computer. Simulated data sets have been used in the studies carried out so far. The results obtained are in good agreement with the test models. (author). 10 refs., 11 figs., 2 tabs.

12777 (DOE/ER/14317–T1) **Structure and modelling of the three-dimensional boundary layer on a rotating disk: Progress report.** Eaton, J.K. Stanford Univ., CA (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER14317. Order Number DE94008501. Source: OSTI; NTIS; GPO Dep.

The objectives of this research are to develop an improved understanding of the effects of mean flow three dimensionality on boundary layer flow and heat transfer. The specific problem of interest, the flow on a large rotating disk in an otherwise quiescent environment was selected for its geometric simplicity and for its relevance to rotating machinery design.

12778 (DOE/ER/25145–T1) **High-resolution numerical methods for compressible multi-phase flow in hierarchical porous media: Progress report, September 1993–September 1994.** Trangenstein, J.A. Duke Univ., Durham, NC (United States). Dept. of Mathematics. 15 Mar 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-92ER25145. Order Number DE94008261. Source: OSTI; NTIS; GPO Dep.

This is the second year in the proposed three-year effort to develop high-resolution numerical methods for multi-phase flow in hierarchical porous media. The issues being addressed in this research are: Computational efficiency: Field-scale simulation of enhanced oil recovery, whether for energy production or aquifer remediation, is typically highly under-resolved. This is because rock transport properties vary on many scales, and because current numerical methods have low resolution. Effective media properties: Since porous media are formed through complex geologic processes, they involve significant uncertainty and scale-dependence. Given this uncertainty, knowledge of ensemble averages of flow in porous media can be preferable to knowledge of flow in specific realizations of the reservoir. However, current models of effective properties do not represent the observed behavior very well. Relative permeability models present a good example of this problem. In practice, these models seldom provide realistic representations of hysteresis, interfacial tension effects or three-phase flow; there are no models that represent well all three effects simultaneously.

12779 (ISRP-K-TD–1) **Ionizing radiations for non-destructive evaluation.** Raj, Baldev (Indira Gandhi Centre for Atomic Research, Kalpakkam (India)); Venkataraman, B. Indian Society for Radiation Physics, Kalpakkam (India). Kalpakkam Chapter. 1989. 50p. Order Number DE94616243. Source: OSTI; NTIS (US Sales Only); INIS.

A state of the art of major non-destructive testing (NDT) techniques based on ionising radiations is presented. These techniques are broadly classified into three categories, namely, radiography, radiation gaging and analytical applications. The basic principles behind each method are explained and salient features of each technique which make it suitable for a particular task are described. Several illustrative applications drawn from the nuclear

industry are given. The monograph is intended to serve as an introductory guide to scientist and engineers engaged in NDT activities. (M.G.B.). 32 refs., 13 figs., 5 tabs.

12780 (UCRL-JC-115704) **Dual-band infrared imaging for concrete bridge deck inspection.** Durbin, P.; Del Grande, N. Lawrence Livermore National Lab., CA (United States). Feb 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940241-2: Structural materials technology - non-destructive technology conference, Atlantic City, NJ (United States), 23-25 Feb 1994). Order Number DE94007126. Source: OSTI; NTIS; GPO Dep.

Dual-band infrared (DBIR) imaging methods and unique image-correction algorithms used successfully for underground and obscured object imaging and detection (of buried mines, archaeological structures, geothermal aquifers and airframe defects) are adapted for inspection of concrete highways and bridge decks to provide early warnings of subsurface defects. To this end, we prepared small concrete test slabs with defects (embedded plastic layers). We used selective DBIR (3–5 μm and 8–12 μm) image ratios to depict the defect sites and remove the effects of surface clutter. We distinguish true temperature-difference signals (at surrogate delamination sites) from emissivity noise (at sites with oil stains, sand, gravel, metal parts and roughness differences) towards improved concrete bridge deck inspections.

12781 (WSRC-MS-93-612) **Flowpath evaluation and reconnaissance by remote field Eddy current testing (FERRET).** Smoak, A.E.; Zollinger, W.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94006673. Source: OSTI; NTIS; GPO Dep.

This document describes the design and development of FERRET (Flowpath Evaluation and Reconnaisance by Remote-field Eddy current Testing). FERRET is a system for inspecting the steel pipes which carry cooling water to underground nuclear waste storage tanks. The FERRET system has been tested in a small scale cooling pipe mock-up, an improved full scale mock-up, and in flaw detection experiments. Early prototype designs of FERRET and the FERRET launcher (a device which inserts, moves, and retrieves probes from a piping system) as well as the field-ready design are discussed.

12782 (Y/EN-4684) **Testing of hollow clay tile masonry prisms.** Jones, W.D.; Butala, M.B. Oak Ridge Y-12 Plant, TN (United States). 15 Oct 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-940466-1: American Society of Civil Engineers (ASCE) structures congress, Atlanta, GA (United States), Apr 1994). Order Number DE94003680. Source: OSTI; NTIS; GPO Dep.

This paper presents test results of 610-mm wide (24-in.) by 1219-mm high (48-in.) by 203-or 330-mm (8- or 13-in.) thick prisms constructed of hollow clay tiles. Three prisms were extracted fro existing hollow clay title walls and 69 were constructed in laboratories at The University of Tennessee and the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. Modulus of Elasticity, E, and compressive strength f'_m were calculated from the results.

4210 Combustion Systems

12783 (LA-SUB-94-26) **Conceptual process description of M division incinerator project.** Thompson, T.K. Los Alamos National Lab., NM (United States); Thompson (T.K.), Inc., White Rock, NM (United States). 13 Apr 1989. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005661. Source: OSTI; NTIS; GPO Dep.

This interoffice memorandum describes an incineration system to be used for incinerating wood. The system is comprised of a shredder and an incinerator. The entire process is described in detail. A brief study of particulates, carbon monoxide, carbon dioxide, and nitrogen oxides emission is presented.

4220 Mining and Underground Engineering

12784 (DOE/MC/28182-94/C0303) **Steerable percussion air drilling system.** Bui, H.D.; Oliver, M.S.; Gray, M.A. Smith International, Inc., Houston, TX (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC28182. (CONF-931156-32: Fuels technology contractors' review meeting, Morgantown, WV (United States), 16-18 Nov 1993). Order Number DE94007321. Source: OSTI; NTIS; GPO Dep.

The cost-sharing contract between the US Department of Energy and Smith International provides the funding to further develop this concept into two complete steerable percussion air drilling system prototypes, each integrated with a navigation tool (wireline steering tool), a bend sub, stabilizing devices, and to conduct laboratory and field testing necessary to prepare the system for commercial realization. Such a system would make available for the first time the ability to penetrate earthen formations by the percussion method, using compressed air as the drilling fluid, and at the same time allow the directional control and steering of the drill bit. While the drill string is not rotating (slide mode), one can orient to build angle in the desired direction at a predictable rate. This build rate can be in the range of 1–20 degrees per one hundred feet and proceeds until the desired inclination or direction has been obtained. The drill pipe is then set in rotation, nullifying the effect of the bend angle, and causes the assembly to drill straight. The sliding procedure can be repeated as often as corrections for hole's inclination or direction are needed.

12785 (EUR-13647) **Summary reports of the R and D programme: primary raw materials (1986-89). Volume 1.** Donato, M. (Commission of the European Communities, Brussels (Belgium)). Commission of the European Communities, Luxembourg (Luxembourg). 1992. 287p. Source: OSTI; NTIS (US Sales Only).

The main objectives of the programme were to enhance the competitiveness of the European Community mining and metallurgical industries and to reduce its vulnerability for minerals, particularly those of critical or strategic interest. It comprised three research areas: research and development exploration (economic geology, methods of geochemical and geophysical prospecting, remote sensing); mining technology (rock fracturing, rock mechanics, support systems, problems associated with depth, robotics, methods of modelling and simulation, problems of small-size mines); mineral processing (hydrometallurgy and pyrometallurgy of complex sulphide ores, oxidized ores, refractory ores, mine tailings and metallurgical residues; modelling and control in mineral processing; industrial minerals).

4230 Marine Engineering

Refer also to citation(s) 12012

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 12275, 12324, 12428, 12453, 12628, 12906, 12976, 12988, 13014, 14209

12786 (ANL/APS/PP-73435) **Programmable CCD imaging system.** Brizard, C.M.; Rodricks, B.G. Argonne National Lab., IL (United States). Jun 1991. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008120. Source: OSTI; NTIS; GPO Dep.

A fully programmable Charge Coupled Device (CCD) imaging detector has been developed. The system is based on the CAMAC standard where all modules are programmable. This programmable flexibility allows the use of CCDs from different manufacturers with minimum software modifications. Three CCDs with radically different readout timings, waveforms, and array sizes have been tested. For imaging purposes, the Texas Instruments TC 215 chip is currently used. It has a large array (1024*1024) and a small pixel size (12 μm). The CCD detector is housed in a vacuum chamber and is thermoelectrically cooled. The vacuum chamber is coupled to a fiber optic taper by means of a set of optical lenses. Micron-resolution pictures have been obtained.

12787 (DOE/ET/53088–635) **Superluminous laser pulse in an active medium.** Fisher, D.L. (Texas Univ., Austin, TX (United States)); Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–635). Order Number DE94007110. Source: OSTI; NTIS; INIS; GPO Dep.

Physical conditions are obtained to make the propagation velocity of a laser pulse and thus the phase velocity of the excited wake be at any desired value, including that equal to or greater than the speed of light. The provision of an active-plasma laser medium with an appropriately shaped pulse allows not only replenishment of laser energy loss to the wakefield but also acceleration of the group velocity of photons. A stationary solitary solution in the accelerated frame is obtained from the model equations and simulations thereof for the laser, plasma and atoms. This approach has applications in photonics and telecommunications as well as wakefield accelerators.

12788 (ENEA-RT-INN–92-20) **Contributions to 9th international symposium on gas flow and chemical lasers.** ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1992. 17p. (CONF-920959–Exc.: 9. international symposium on gas flow and chemical lasers, Heraklion (Greece), 21-25 Sep 1992). Order Number DE94716575. Source: OSTI; NTIS (US Sales Only).

Two papers are included: excimer laser development and applications at the ENEA Frascati Center, and the self-injected XeCl excimer laser. They are processed separately for the data base.

12789 (ENEA-RT-INN–92-20, pp. 5-12) **Excimer laser development and applications at ENEA Frascati Centre.** Letardi, T. (ENEA, Frascati (Italy). Dipt. Sviluppo Tecnologie di Punta); Bollanti, S.; Di Lazzaro, P. ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione. Nov 1992. (CONF-920959–Exc.: 9. international symposium on gas flow and chemical lasers, Heraklion (Greece), 21-25 Sep 1992). In *Contributions to 9th international symposium on gas flow and chemical lasers.* 17p. Order Number DE94716575. Source: OSTI; NTIS (US Sales Only).

In this paper are presented some recent results obtained in the laboratory on excimer laser development and applications. Even if the activity has been initiated as far as 15 years ago, only after 1986, following the European Eurolaser Initiative, the programs have been strengthened and enlarged to more ambitious goals, according to the increased attention to this field. Actually the activity can be shared in the following lines: (a) development of source, (b) computer models, (c) special devices, (d) applications. The description of the activity will be presented ordered according to the above mentioned lines, with special attention to the most recent results.

12790 (ENEA-RT-INN–93-10) **FEL small signal dynamics and electron beam prebunching.** Dattoli, G. (ENEA, Frascati (Italy). Dipt. Sviluppo Tecnologie di Punta); Ottaviani, P.L. No corporate text available. 1993. 23p. Order Number DE94752518. Source: OSTI; NTIS (US Sales Only).

A seed signal and/or a pre-bunched electron beam may provide the start up of a free electron laser (FEL). Recently, interest has grown around FEL's operating with pre-bunched electron beams; this paper is, therefore, devoted to the analysis of the dynamic features of FEL's operating in such a configuration. It exploits a slightly modified form of the FEL high gain equation to derive quantities of practical interest like the dependence of the system growth rate on the bunching coefficients.

12791 (ETDE-IT–94-18) **Parametric study of x-ray preionizer with plasma cathode.** Bollanti, S. (ENEA, Frascati (Italy)); Di Lazzaro, P.; Flora, F.; Giordano, G.; Letardi, T.; Schina, G.; Zheng, C. No corporate text available. 1993. 38p. Order Number DE94752520. Source: OSTI; NTIS (US Sales Only).

The construction characteristics and the performance of an x-ray diode working at 200 Hz are described. The temporal behavior of both the plasma cathode emission and the diode discharge was studied, including the measurements of vacuum effects on the repetition rate and lifetime capability, pre-ionization versus electrical features, and ionization density versus dosage. This simple and low-cost x-ray diode was used to uniformly pre-ionize a half-liter XeCl laser, delivering an output laser energy of 800 mJ/shot at a 100-Hz repetition rate.

12792 (ETDE-IT–94-29) **Optical monitoring of varying radial thickness thin film during ion beam assisted deposition process.** Flori, D. (ENEA, Casaccia (Italy)); Caneve, L.; Scaglione, S. No corporate text available. 1993. 3p. (CONF-9306311–1: 9. international colloquium on plasma processes, Antibes-Juan Les Pins (France), 6-11 Jun 1993). Order Number DE94752550. Source: OSTI; NTIS (US Sales Only).

A new class of laser optical components needs a coating with one or more layers with a radially variable thickness in order to achieve a reflectivity value varying from the center of the component ($R_m$ax) to its periphery. The behavior of the reflectivity versus the substrate radius can be tailored by putting a proper designed mask in front of a rotating substrate during the evaporation process. The optical characteristics of the fabricated coating were controlled by optical monitoring properly modified in order to observe the reflectivity both on the center of the substrate (maximum of the reflectivity) and on the point where the reflectivity of the whole component should be approximately zero.

12793 (INIS-mf–13749, pp. 5) **Diffraction limited lasers.** Svelto, O. (Politecnico di Milano, Milan (Italy). Ist. di Fisica). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASERS/diffraction; LASERS; DIFFRACTION; RESONATORS; REVIEWS

12794 (INIS-mf–13749, pp. 6) **The applications of lasers.** Svelto, O. (Politecnico di Milano, Milan (Italy). Ist. di Fisica). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASERS/uses; COMMUNICATIONS; LASERS; USES; MATERIALS WORKING; MEDICINE

12795 (INIS-mf–13749, pp. 7) **Femtosecond lasers and their applications in nonlinear photonics.** Peyghambarian, N. (Arizona Univ., Tucson, AZ (United States). Optical Sciences Center). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASERS/uses; ASYMMETRY; CHARGE CARRIERS; LASERS; USES; MODULAR STRUCTURES; NONLINEAR PROBLEMS; PULSES; REFLECTION; SEMICONDUCTOR DEVICES; SWITCHES

12796 (INIS-mf–13749, pp. 11) **LD pumped yttrium aluminium garnet micro-chip lasers.** Zhenguo, SH. (Academia Sinica, Shanghai, SH (China). Shanghai Inst. of Optics and Fine Mechanics); Yuhua, S.; Ziliang, F.; Yuzhen, T.; Guosong, H.; Liqing, S.; Fuzheng, Z. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM LASERS; LASER CAVITIES; OPTICAL PUMPING; WAVELENGTHS

12797 (INIS-mf–13749, pp. 12) **Application of a generalized self-filtering unstable resonator (GSFUR) in a nitrogen-pumped dye laser.** Farahbod, A.H. (Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Reseach Center); Hariri,

A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DYE LASERS/resonators; RESONATORS; REMOTE SENSING; USES

12798 (INIS-mf–13749, pp. 13) **The production of picosecond pulses of generation of dye laser excited by the radiation of argon laser with passively synchronized modes.** Nazarov, B.I. (S.U. Umarov Physico-Technical Institute of Tadjik Academy of Sciences (Tajikistan)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DYE LASERS/synchronization; SYNCHRONIZATION; EXCITATION; GAS LASERS; PULSES

12799 (INIS-mf–13749, pp. 15) **Free electron laser with longitudinal electric field and axial magnetic field.** Maraghechi, B. (Amir kabir Univ., Tehran (Iran, Islamic Republic of). Dept. of Physics); Willett, J.E.; Mehdian, H. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FREE ELECTRON LASERS; ELECTRIC FIELDS; EXCITATION; MAGNETIC FIELDS; SPACE CHARGE; WAVE EQUATIONS

12800 (INIS-mf–13749, pp. 16) **Gain estimation in gasdynamic lasers using an indirect coupled method.** Shojaei, M. (Shahid Bahonar Univ., Kerman (Iran, Islamic Republic of). Dept. of Physics); Bahrampour, A.R. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GAS DYNAMIC LASERS/gain; CARBON DIOXIDE; COUPLING; GAIN; GAS FLOW; ISENTROPIC PROCESSES; THERMODYNAMICS

12801 (INIS-mf–13749, pp. 25) **Powerful multichannel Nd:Glass laser tunable in wide spectral range.** Begishev, I.A. (NPO Akadempribor, Academy of Science of Uzbekistan, Akademgorodok, Tashkent (Uzbekistan)); Gulamov, A.A.; Erofeev, E.A.; Kulagin, I.A.; Redkorechev, V.I.; Usmanov, T.; Khadzhaev, A.D. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEODYMIUM LASERS/tuning; ENERGY CONVERSION; LINE WIDTHS; TUNING

12802 (INIS-mf–13749, pp. 26-27) **Monochromatic, high speed lasing in quantum well heterostructure semiconductor lasers: The latest advances and intersubband and intrasubband transitions mechanisms.** Khoie, A. (Nevada Univ., Las Vegas, NV (United States). Dept. of Electrical and Computer Engineering). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SEMICONDUCTOR LASERS/energy-level transitions; ALUMINIUM ARSENIDES; GALLIUM ARSENIDES; GHZ RANGE 100-1000; LINE WIDTHS; MONOCHROMATIC RADIATION; OPERATION

12803 (INIS-mf–13749, pp. 28) **Effect of gain compression, spontaneous emission coupling co-efficient and driver parasitic s on the response of the single-mode semiconductor laser.** Arbab-Tafti, H. (School of Electronics and Communication Engineering, College of Engineering, Anna Univ., Guindy Madras (India)); Papa, F.F.; Vaya, P.R. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SEMICONDUCTOR LASERS/response functions; EMISSION; GAIN

12804 (INIS-mf–13749, pp. 56) **Tunable coherent V U V/X U V radiation generated by nonlinear optical process.** Tao-Heng Sun (Beijing Univ., BJ (China). Dept. of Physics); Ce-Chan Tian. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. X-RAY LASERS/nonlinear optics; COHERENT RADIATION; EFFICIENCY; TUNING; ULTRAVIOLET RADIATION

12805 (INIS-mf–13749, pp. 91) **GaSe detector for dye laser pulses.** Salmanov, V.M. (Tabriz Univ., (Iran, Islamic Republic of). Center for Applied Physics Reseach); Bidadi, M.; Tadjalli, M.; Kalafi, M. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 41-42.

Short communication. DYE LASERS/performance testing; ELECTRIC CONDUCTIVITY; INDIUM; LAYERS; PULSES; RECOMBINATION; SPECTRA

12806 (INIS-mf–13749, pp. 93) **Laser photoreceivers for infrared region.** Qajar, CH. (Inst. of photoelectronics, Baku (Azerbaijan)); Guseinov, E.; Mamedbayli, I. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASERS/photoresistors; CADMIUM TELLURIDES; INFRARED RADIATION; LASERS; PHOTORESISTORS; MERCURY TELLURIDES

12807 (INIS-mf–13749, pp. 100) **Use of the optogalvanic effect for determining the gas temperature in a discharge tube.** Soltanmoradi, F. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of). Laser Research Center); Ghafari, M.R.; Sadr-Ghayeni, S.M.R. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CARBON DIOXIDE LASERS/gas discharge tubes; CARBON DIOXIDE LASERS/temperature measurement; GAIN; GASES; HELIUM; LOW PRESSURE; NITROGEN

12808 (LA-UR–94-526) **Repetitively pulsed Cr:LISAF laser for lidar applications.** Shimada, Tsutomu; Early, J.W.; Lester, C.S.; Cockroft, N.J. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940226–4: 9. advanced solid-state lasers meeting, Salt Lake City, UT (United States), 7-10 Feb 1994). Order Number DE94007546. Source: OSTI; NTIS; GPO Dep.

A Cr:LiSAF laser has been successfully operated at time averaged powers up to 11 W and at pulse repetition rates to 12 Hz. During Q-switch operation, output energy as high as 450 mJ (32 ns FWHM) was obtained. Finally, line narrowed Q-switched pulses (< 0.1 nm) from the Cr:LiSAF laser were successfully used as a tunable light source for lidar to measure atmospheric water content.

12809 (LA-UR–94-528) **Short-pulse, high-intensity lasers at Los Alamos.** Taylor, A.J.; Roberts, J.P.; Rodriguez, G.; Fulton, R.D.; Kyrala, G.A.; Schappert, G.T. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931048–10: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94007545. Source: OSTI; NTIS; GPO Dep.

Advances in ultrafast lasers and optical amplifiers have spurred the development of terawatt-class laser systems capable of delivering focal spot intensities approaching 10^{20} W/cm^2. At these extremely high intensities, the optical field strength is more than twenty times larger than the Bohr electric field, permitting investigations of the optical properties of matter in a previously unexplored regime. The authors describe two laser systems for high intensity laser interaction experiments: The first is a terawatt system based on amplification of femtosecond pulses in XeCl which yields 250 mJ in 275 fs and routinely produces intensifies on target in excess of 10^{18} W/cm^2. The second system is based on chirped pulse amplification of 100-fs pulses in Ti:sapphire.

12810 (LA-UR–94-597) **COVICS: A covert video communications system.** Bracht, R.; Kuckertz, T. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940378–1: Radio frequency (RF) Expo West, San Jose, CA (United States), 23 Mar 1994). Order Number DE94007568. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A covert video communications system compatible with narrow band satellite use has been developed. The system communications by modulating reflected energy. This means that no energy is actively generated at the passive end of the link. Only the antenna is impedance is modulated to return the information. The recovered signal is then coherently demodulated to recover the information. The system uses microstrip antennas, operates at 10 GHz, and has a range of about 5 km. The video is slow scan and is updated every 2 seconds, and thus can be sent over a 2400 baud line such as is required for some satellite communications systems. A combination of discrete cosine transform and video differencing was used to achieve a high degree of video compression.

12811 Generation of low-divergence laser beams. Kronberg, J.W. To Dept. of Energy. 1992. U.S. patent application 7-817,009. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007361. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus for transforming a conventional beam of coherent light, having a Gaussian energy distribution and relatively high divergence, into a beam in which the energy distribution approximates a single, non-zero-order Bessel function and which therefore has much lower divergence. The apparatus comprises a zone plate having transmitting and reflecting zones defined by the pattern of light interference produced by the combination of a beam of coherent light with a Gaussian energy distribution and one having such a Bessel distribution. The interference pattern between the two beams is a concentric array of multiple annuli, and is preferably recorded as a hologram. The hologram is then used to form the transmitting, and reflecting zones by photo-etching portions of a reflecting layer deposited on a plate made of a transmitting material. A Bessel beam, containing approximately 50% of the energy of the incident beam, is produced by passing a Gaussian beam through such a Bessel zone plate. The reflected beam, also containing approximately 50% of the incident beam energy and having a Bessel energy distribution, can be redirected in the same direction and parallel to the transmitted beam. Alternatively, a filter similar to the Bessel zone plate can be placed within the resonator cavity of a conventional laser system having a front mirror and a rear mirror, preferably axially aligned with the mirrors and just inside the front mirror to generate Bessel energy distribution light beams at the laser source.

12812 Laser focus compensating sensing and imaging device. Vann, C.S. To Dept. of Energy. 1992. U.S. patent application 7-848,583. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007335. Source: OSTI; NTIS; GPO Dep.

A laser focus compensating sensing and imaging device permits the focus of a single focal point of different frequency laser beams emanating from the same source point. In particular it allows the focusing of laser beams originating from the same laser device but having differing intensities so that a low intensity beam will not convert to a higher frequency when passing through a conversion crystal associated with the laser generating device. The laser focus compensating sensing and imaging device uses a cassegrain system to fold the lower frequency, low intensity beam back upon itself so that it will focus at the same focal point as a high intensity beam. An angular tilt compensating lens is mounted about the secondary mirror of the cassegrain system to assist in alignment. In addition cameras or CCD's are mounted with the primary mirror to sense the focused image. A convex lens in positioned coaxial with the cassegrain system on the side of the primary mirror distal of the secondary for use in aligning a target with the laser beam. A first alternate embodiment includes a cassegrain system using a series of shuttles and an internally mounted dichroic mirror. A second alternate embodiment uses two laser focus compensating sensing and imaging devices for aligning a moving tool with a work piece.

12813 Superconducting active impedance converter. Ginley, D.S.; Hietala, V.M.; Martens, J.S. To Dept. of Energy. 1992. Filed date 12 Mar 1992. U.S. patent application 7-850,475. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Order Number DE94007334. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a transimpedance amplifier for use with high temperature superconducting, other superconducting, and conventional semiconductor allows for appropriate signal amplification and impedance matching to processing electronics. The amplifier incorporates the superconducting flux flow transistor into a differential amplifier configuration which allows for operation over a wide temperature range, and is characterized by high gain, relatively low noise, and response times less than 200 picoseconds over at least a 10–80 K temperature range. The invention is particularly useful when a signal derived from either far-IR focal plane detectors or from Josephson junctions is to be processed by higher signal/higher impedance electronics, such as conventional semiconductor technology.

12814 Microchannel cooling of face down bounded chips. Bernhardt, A.F. To Dept. of Energy. 1992. U.S. patent application 7-850,634. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007332. Source: OSTI; NTIS; GPO Dep.

The present invention relates to cooling high power integrated circuits; and particularly to microchannel cooling of integrated circuits bonded face down on circuit boards, such as by flip-chip bonding. Microchannel cooling is applied to flip-chip bonded integrated circuits, in a manner which maintains the advantages of flip-chip bonds, while overcoming the difficulties encountered in cooling the chips. The technique is suited to either multichip integrated circuit

boards in a plane, or to stacks of circuit boards in a three dimensional interconnect structure. Integrated circuit chips are mounted on a circuit board using flip-chip or control collapse bonds. A microchannel structure is essentially permanently coupled with the back of the chip. A coolant delivery manifold delivers coolant to the microchannel structure, and a seal consisting of a compressible elastomer is provided between the coolant delivery manifold and the microchannel structure. The integrated circuit chip and microchannel structure are connected together to form a replaceable integrated circuit module which can be easily decoupled from the coolant delivery manifold and the circuit board. The coolant supply manifolds may be disposed between the circuit boards in a stack and coupled to supplies of coolant through a side of the stack.

12815 Three dimensional, multi-chip module. Bernhardt, A.F.; Petersen, R.W. To Dept. of Energy. 1992. U.S. patent application 7-850,642. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007331. Source: OSTI; NTIS; GPO Dep.

The present invention relates to integrated circuit packaging technology, and particularly to three dimensional packages involving high density stacks of integrated circuits. A plurality of multi-chip modules are stacked and bonded around the perimeter by sold-bump bonds to adjacent modules on, for instance, three sides of the perimeter. The fourth side can be used for coolant distribution, for more interconnect structures, or other features, depending on particular design considerations of the chip set. The multi-chip modules comprise a circuit board, having a planarized interconnect structure formed on a first major surface, and integrated circuit chips bonded to the planarized interconnect surface. Around the periphery of each circuit board, long, narrow "dummy chips" are bonded to the finished circuit board to form a perimeter wall. The wall is higher than any of the chips on the circuit board, so that the flat back surface of the board above will only touch the perimeter wall. Module-to-module interconnect is laser-patterned on the sides of the boards and over the perimeter wall in the same way and at the same time that chip to board interconnect may be laser-patterned.

12816 (PNL-SA-23676) **A noncritically phase matched femtosecond Optical Parametric Oscillator near 3 microns.** Holtom, G.R.; Crowell, R.A.; Xie, X.S. Pacific Northwest Lab., Richland, WA (United States). Feb 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940226-5: 9. advanced solid-state lasers meeting, Salt Lake City, UT (United States), 7-10 Feb 1994). Order Number DE94008050. Source: OSTI; NTIS; GPO Dep.

An optical parametric oscillator designed for the 3μm spectral region is described. Pulses shorter than 100 fs are produced. Alignment is simple and conversion efficiency is good.

12817 (SAND-93-1785C) **Metal-ion spin-on glasses: Novel materials for active waveguides.** Ashby, C.I.H.; Sullivan, C.T.; Vawter, G.A.; Hohimer, J.P.; Hadley, G.R.; Neal, D.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940142-24: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007738. Source: OSTI; NTIS; GPO Dep.

Monolithic integration of a rare-earth-ion-based active waveguide on the same wafer as its diode pump laser would permit compact packaging of the technology demonstrated in fiber lasers and amplifiers. This new monolithic technology would offer the potential for developing compact infrared and visible (up-conversion) lasers, amplifiers, and other photonic integrated circuit components. One approach that we are investigating for such monolithic integration uses a high concentration of one or more rare-earth ions incorporated into polysiloxane spin-on glasses that are solvent-cast onto III-V semiconductor wafers. This "fiber on a chip" technology substitute a relatively high-ion-concentration, short-length metal-ion spin-on glass (MISOG) waveguide for the low-ion-concentration, long-length fiber. Progress to data on developing MISOG waveguide materials and technology is discussed.

12818 (SAND-94-0163C) **Thin-film decoupling capacitors for multi-chip modules.** Dimos, D.: Lockwood, S.J.; Schwartz, R.W.; Rodgers, M.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940596-2: 44. electronic components and technology conference, Washington, DC (United States), 1-4 May 1994). Order Number DE94007743. Source: OSTI; NTIS; GPO Dep.

Thin-film decoupling capacitors based on ferroelectric lead lanthanum zirconate titanate (PLZT) films are being developed for use in advanced packages, such as multi-chip modules. These thin-film decoupling capacitors are intended to replace multi-layer ceramic capacitors for certain applications, since they can be more fully integrated into the packaging architecture. The increased integration that can be achieved should lead to decreased package volume and improved high-speed performance, due to a decrease in interconnect inductance. PLZT films are fabricated by spin coating using metal carboxylate/alkoxide solutions. These films exhibit very high dielectric constants ($\varepsilon \geq 900$), low dielectric losses ($\tan\delta$ = 0.01), excellent insulation resistances ($\rho > 10^{13}$ Ω-cm at 125°C), and good breakdown field strengths (E_B = 900 kV/cm). For integrated circuit applications, the PLZT dielectric is less than 1 μm thick, which results in a large capacitance/area (8-9 nF/mm^2). The thin-film geometry and processing conditions also make these capacitors suitable for direct incorporation onto integrated circuits and for packages that require embedded components.

12819 (SAND-94-0402C) **The advent of failure analysis software technology.** Henderson, C.L. (Sandia National Labs., Albuquerque, NM (United States)); Barnard, R.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940453-2: International reliability physics symposium, San Jose, CA (United States), 11-14 Apr 1994). Order Number DE94006593. Source: OSTI; NTIS; GPO Dep.

The increasing complexity of integrated circuits demands that software tools, in addition to hardware tools, be used for successful diagnosis of failure. A series of customizable software tools have been developed that organize failure analysis information and provide expert level help to failure analysts to increase their productivity and success.

12820 (UCRL-CR-116290) **High power switch design for the Nova upgrade laser (Project Hercules): Final report, August 15, 1991-May 31, 1993.** Giesselmann, M. (Texas Tech Univ., Lubbock, TX (United States). Pulsed Power Lab.). Lawrence Livermore National Lab., CA (United States); Texas Tech Univ., Lubbock, TX (United States). Pulsed Power Lab. [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007921. Source: OSTI; NTIS; GPO Dep.

A test facility has been constructed to test high power ignitrons using an electrolytic bank. The goal of this project, which was named Hercules (High Energy Research Concerning the Ultimate Lifetime of Experimental Switches), was to test the lifetime and switching characteristics of high power ignitrons for Lawrence Livermore's laser upgrade program. The main tubes of interest that have been tested were the NL-9000A from Richardson Electronics, and the BK-1002 from English Electric Valve (EEV). Both tubes have stainless steel, cup style anodes. Both tubes were connected in series for the tests. Required test parameters were Ipeak = 300 kA, and Qtransfer = 200 C. During the tests, the BK-1002 tube failed due to ignitor shorting. The average forward voltage drop across the EEV tube was almost twice than the drop across the NL-9000A. After the tube failure, the BK-1002 was replaced by a NL-1057 to continue testing of the NL-9000A.

12821 (UCRL-JC-115120) **Sol-gel coatings for high power laser optics-past, present and future.** Thomas, I.M. Lawrence Livermore National Lab., CA (United States). 21 Dec 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931054-9: 25. Boulder damage symposium: annual symposium on optical materials for high-power lasers, Boulder, CO (United States), 27-29 Oct 1993). Order Number DE94007240. Source: OSTI; NTIS; GPO Dep.

An investigation into the preparation of sol-gel coatings for high power lasers was started at LLNL in 1983 and AR coatings were successfully developed for use in the Nova laser in 1984. Several other large lasers now use these coatings. Subsequent work on HR coatings resulted in AlOOH/SiO_2 and later ZrO_2 or HfO_2/SiO_2 systems of good optical performance. The use of organic polymer binders gave increased damage threshold and enhanced optical performance. We are in the process of scaling up HR fabrication for substrates approximately 38 cm square. Concurrently we are developing sol-gel random phase plates for laser beam smoothing. These have a patterned surface design of silica which induces phase shifts in the beam by variation in the optical path length. Plates of this type on 80 cm diameter substrates have been used successfully on the Nova.

12822 (UCRL-JC–115687) **High average power pulsed phase conjugate laser with birefringence correction.** Bowers, M.W.; Hankla, A.K.; Jacobson, G.F. Lawrence Livermore National Lab., CA (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940582–1: CLEO '94: conference on lasers and electro-optics, Anaheim, CA (United States), 8-13 May 1994). Order Number DE94006049. Source: OSTI; NTIS; GPO Dep.

We have developed a Nd: YAG laser that delivers 2.5 Joules per 10 ns pulse at a 10 Hz repetition rate. The output beam is a flat top with 1.5 times diffraction limited beam quality with 7% depolarization.

43 PARTICLE ACCELERATORS

Refer also to citation(s) 12434, 12693, 13425, 13426, 13701, 13713, 14228

12823 (INIS-mf–14182) **Deutsches Elektronen-Synchrotron DESY. Scientific annual report 1992.** Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Nov 1993. 369p. (In German). Order Number DE94747245. Source: OSTI; NTIS (US Sales Only); INIS.

The main event in 1992 was the beginning of the research program of HERA. The annual report covers activities in research, machinery, central data processing, development, and operation. There is much interest in international cooperation. (HP)

12824 (IYaF–92-31) **Fractal model of the ground.** Parkhomchuk, V.V.; Shil'tsev, V.D. AN SSSR, Novosibirsk (Russian Federation). Inst. Yademoj Fiziki. 1992. 16p. (In Russian). Order Number DE94616112. Source: OSTI; NTIS (US Sales Only); INIS.

The most general characteristics of Earth surface elements movements are discussed. Some predictions of suggested fractal model of the ground are compared with geophysical data and results of observations at UNK, SLC and PEP sites. The studies of surface points movements in range of time intervals from few seconds to few years with characterized distances between two points from meters to dozen kilometers are important from designs of correction systems of circular and linear supercolliders. The work proves new view on such displacements as universal Brownian movements in a media with non-integer dimension. 8 refs.; 8 figs.

12825 (SLAC–430) **Proceedings of a workshop on Applications of Accelerators.** Herrmannsfeldt, W.B. (ed.) (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Sessler, A.M.; Alonso, J.R. (eds.). Stanford Linear Accelerator Center, Menlo Park, CA (United States). 31 Jan 1994. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; AC03-76SF00098. (LBL–35023; CONF-931248–: Workshop on applications of accelerators, Stanford, CA (United States), 1-2 Dec 1993). Order Number DE94008435. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of material collected as the results of a workshop, Applications of Accelerators, held at the Stanford Linear Accelerator Center, 1–2 December 1993. The material collected here has been edited for style and to minimize duplication. Footnotes will identify the original source of the material. We believe that the reader will find that this document has something for every interest. There are applications in the fields of health, food preservation, energy, environmental monitoring and protection, and industrial processing. Man y of the examples discussed have already passed the demonstration stage. Most of the others are the subject of active accelerator research. Taken as a whole, the particle accelerator field contains a wealth of application opportunities, some already in use, and many more ready to be exploited.

4301 Design, Development, and Operation

Refer also to citation(s) 12787, 13387

12826 (PCCF-RI–93-08, pp. 19-21) **Heavy ion accelerators and radioactive beams for biomedical applications.** Bimbot, R. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Facilities in Europe which can produce ultrarelativistic heavy ion beams with ranges exceeding 25 cm in water are the Saturne national accelerator in Saclay and the GSI Synchrotron SIS in Darmstadt. These machines are presented, together with less energetic ones which are, or can be used for pretherapeutic biomedical studies. (R.P.) 28 refs.

12827 (PCCF-RI–93-08, pp. 34-35) **Present status of HIMAC.** Kohno, T. (National Inst. of Radiological Sciences, Chiba (Japan)); Ogawa, H.; Yamada, S.; Sato, Y.; Yamada, T.; Murakami, T.; Kitagawa, A.; Yoshizawa, J.; Sato, K.; Itano, A. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

HIMAC is a heavy ion accelerator complex dedicated to medical use, especially clinical treatments of tumors. It comprises two ion sources, an RFQ linac, an Alvarez linac, two synchrotron rings, a high-energy beam transport (HEBT) system and an irradiation system. An outline of HIMAC and its present status is presented. (R.P.) 5 refs.

12828 (SAND–93-1764C) **Performance of an induction coil launcher.** Shokair, I.R.; Cowan, M.; Kaye, R.J.; Marder, B.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940481–4: 7. symposium on electromagnetic launch technology, San Diego, CA (United States), 20-24 Apr 1994). Order Number DE94005282. Source: OSTI; NTIS; GPO Dep.

Performance of an electromagnetic induction launcher is considered for three types of armatures. These are: Solid, 1-element wound and 16-element wound aluminum armatures. The one element wound armature has uniform current density throughout. Because of the uniformity of the current density, the wound armature can withstand field reversal and still maintain low temperature. Slingshot simulations were performed for several configurations. Best performance was obtained for a single element wound armature with two field reversals. For a 60 kg projectile, 10.5 cm coil inner radius and 5.5 cm coil build, the velocity after 50 meters of launcher length (670 stages) exceeded 3.5 km/sec with an overall efficiency of about 45%. For the same parameters the solid and 16-element wound armatures reach a velocity of about 3.3 km/sec after 800 stages (60 meters of launcher length) but without field reversal. A velocity of 3.5 km/sec is possible after 60 meters of launcher length with the 16-element wound armature with one field reversal, but the temperature is close to the melting temperature of aluminum. In all simulations with a solid armature, melting of some of the surface material occurs. However, it is shown that most of the melting occurs after contribution has been made to the forward going pressure, that is, melting does not affect the electrical performance of the launcher. The effect of coil firing time jitter on

launcher performance is also considered and is found to be very small for realistic perturbations. For $\pm$ 2 μ-secs random jitter, the reduction in the final velocity for a 60 meter launcher with a solid armature is less than 0.1% and the increase in temperature is only 2%. This result holds for all types of armatures.

12829 (SAND–93-1765C) **Projectile transverse motion and stability in electromagnetic induction launchers.** Shokair, I.R. Sandia National Labs., Albuquerque, NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940481–3: 7. symposium on electromagnetic launch technology, San Diego, CA (United States), 20-24 Apr 1994). Order Number DE94005284. Source: OSTI; NTIS; GPO Dep.

The transverse motion of a projectile in an electromagnetic induction launcher is considered. The equations of motion for translation and rotation are derived assuming a rigid projectile and a flyway restoring force per unit length that is proportional to the local displacement. Linearized transverse forces and torques due to energized coils are derived for displaced or tilted armature elements based on a first order perturbation method. The resulting equations of motion for a rigid projectile composed of multiple elements in a multi-coil launcher are analyzed as a coupled oscillator system of equations and a simple linear stability condition is derived. The equations of motion are incorporated into the 2-D Slingshot circuit code and numerical solutions for the transverse motion are obtained. For a launcher with a 10 cm bore radius with a 40 cm long solid armature, we find that stability is achieved with a restoring force (per unit length) constant of $k \approx 1 \times 10^8$ N/m^2. For $k = 1.5 \times 10^8$ N/m^2 and sample coil misalignment modeled as a sine wave of 1 mm amplitude at wavelengths of one or two meters, the projectile displacement grows to a maximum of 4 mm. This growth is due to resonance between the natural frequency of the projectile transverse motion and the coil displacement wavelength. This resonance does not persist because of the changing axial velocity. Random coil displacement is also found to cause roughly the same projectile displacement. For the maximum displacement a rough estimate of the transverse pressure is 50 bars. Results for a wound armature with uniform current density throughout show very similar displacements.

12830 (SLAC-PUB–6417) **Linear colliders: The last ten years and the next ten years.** Siemann, R.H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-931253–1: Sessler symposium on beam physics, Berkeley, CA (United States), 6 Dec 1993). Order Number DE94007092. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the past history and the future development of linear colliders.

4302 Beam Dynamics, Field Calculations, and Ion Optics

Refer also to citation(s) 12790, 12791, 12868, 14245

12831 (BNL–49654) **Skew quadrupole errors in the RHIC IR triplets.** Tepikian, S.; Peggs, S. Brookhaven National Lab., Upton, NY (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931254–3: Orbit analysis workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE94007979. Source: OSTI; NTIS; INIS; GPO Dep.

From simulation studies of the RHIC lattice, we found that skew quadrupole errors and quadrupole roll misalignments in the IR triplets (where the β function can be large) produce large vertical dispersions. A simple model, using only one triplet, is applied to obtain sensitivities of vertical dispersion to skew quadrupole errors. This study revealed that measuring the vertical dispersion in the triplets is a good tool for the diagnosis of local skew quadrupole correction.

12832 (BNL–52389, pp. 282-287) **Prospects of polarization at high energies.** Lee, S.Y. (Indiana Univ., Bloomington, IN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Acceleration and Storage of Polarized Protons in High Energy Synchrotrons are Reviewed. Expected performance of these polarized beam facilities at BNL, FNAL, IUCF, and TRIUMF is discussed.

12833 (BNL–60090) **Linear orbit parameters for the exact equations of motion.** Parzen, G. Brookhaven National Lab., Upton, NY (United States). Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (AD/RHIC–127). Order Number DE94007169. Source: OSTI; NTIS; INIS; GPO Dep.

This paper defines the beta function and the other linear orbit parameters using the exact equations of motion. Then may be desirable in the following situations: (1) symplectic long term tracking using a procedure where the magnets are replaced by a sequence of point magnets and drift spaces. For the tracking to be symplectic, one has to use the solutions of the exact equations of motion; (2) small accelerators where the approximations made in deriving the approximate equation of motion may not be valid.

12834 (DOE/ER/10666–10) **Advanced methods for the computation of particle beam transport and the computation of electromagnetic fields and beam-cavity interactions: Final report.** Dragt, A.J.; Gluckstern, R.L. Maryland Univ., College Park, MD (United States). Dept. of Physics. Nov 1992. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AS05-80ER10666. Order Number DE94007954. Source: OSTI; NTIS; INIS; GPO Dep.

The University of Maryland Dynamical Systems and Accelerator Theory Group carries out research in two broad areas: the computation of charged particle beam transport using Lie algebraic methods and advanced methods for the computation of electromagnetic fields and beam-cavity interactions. Important improvements in the state of the art are believed to be possible in both of these areas. In addition, applications of these methods are made to problems of current interest in accelerator physics including the theoretical performance of present and proposed high energy machines. The Lie algebraic method of computing and analyzing beam transport handles both linear and nonlinear beam elements. Tests show this method to be superior to the earlier matrix or numerical integration methods. It has wide application to many areas including accelerator physics, intense particle beams, ion microprobes, high resolution electron microscopy, and light optics. With regard to the area of electromagnetic fields and beam cavity interactions, work is carried out on the theory of beam breakup in single pulses. Work is also done on the analysis of the high frequency behavior of longitudinal and transverse coupling impedances, including the examination of methods which may be used to measure these impedances. Finally, work is performed on the electromagnetic analysis of coupled cavities and on the coupling of cavities to waveguides.

12835 (DOE/ET/53088–636) **Particle diffusion from the beam-beam interaction in synchrotron colliders.** Koga, J.K. (Texas Univ., Austin, TX (United States)); Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Jan 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–636). Order Number DE94007111. Source: OSTI; NTIS; INIS; GPO Dep.

The authors investigate the beam-beam interaction in a synchrotron collider, specifically studying slow particle diffusion in phase space away from tune resonances. Using the tune and tune shift of contemporary large hadron colliders as reference parameters. The computation shows all particles diffusive after 10^5 rotations in contrast to previous single particle tracking results. The diffusion coefficients are several orders of magnitude higher than the tracking code and increase exponentially with the action, caused by the collision induced variation of the second moment of the beams (x^2).

12836 (EUR–13574(V.1), pp. 421-435) **Peculiarities of Sr-90 migration in the environment.** Romanov, G.N.; Stukin, D.A.;

Aleksakhin, R.M. Commission of the European Communities, Luxembourg (Luxembourg). 1991. (CONF-9010134–: Seminar on comparative assessment of the environmental impact of radionuclides released during three major nuclear accidents: Kyshtym, Windscale, Chernobyl, Luxembourg (Luxembourg), 1-5 Oct 1990). In *Seminar on Comparative assessment of the environmental impact of radionuclides released during three major nuclear accidents: Kyshtym, Windscale, Chernobyl. Vol. 1.* 606p. Order Number DE94612954. Source: OSTI; NTIS (US Sales Only); INIS.

The Eastern Urals radioactive track which formed as a result of the Kyshtym accident constituted a natural experimental base for studying the dynamics of Sr-90 behaviour and migration in the environment. Sr-90 behaviour in soil depends on the processes involved in its physical migration horizontally (water runoff, wind transport) and vertically (effective diffusion), on the intensity with which the physico-chemical forms of strontium change, and primarily on Sr-90 incorporation into the soil-absorptive complex. Over 30 years the effective diffusion processes led to downward displacement of Sr-90 in undisturbed soil to a depth of 30 to 50 cm. In 1988 84-94% of the Sr-90 was located in the 10 cm layer as against 90% in the 2 cm layer in the initial 1 or 2 years. The amount of Sr-90 in mobile forms in leached chernozem and grey forest soil hardly changed over time, amounting to between 76 and 90%. In the first 5-10 years Sr-90 surface water runoff was about 0.2% (and Sr-90 wind resuspension 0.1-1.0%) per year of the Sr-90 inventory per unit area. Due to Sr-90 loss from the top soil layer the water runoff and wind resuspension processes decreased exponentially, halving every 4 to 5 years. In most cases, Sr-90 transfer from soil to plants via the roots does not involve discrimination of Sr-90 with regard to calcium, and therefore the Sr-90 accumulation level in various species of natural and agricultural plants depends on their calcium requirements and the amount of exchangeable calcium in the soil. This made it possible to work out quantitative indices for forecasting Sr-90 accumulation in various species of plants for given types of soil. As Sr-90 moves through the trophic chains (including the agricultural one) we find - depending on whether two adjoining links discriminate against it or not as regards calcium - that some organisms reject it while others concentrate it.

12837 (FNAL/C–93/174) **Experimental determination of a betatron difference resonance.** Ellison, M. (Indiana Univ., Bloomington, IN (United States)); Ball, M.; Brabson, B. Fermi National Accelerator Lab., Batavia, IL (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH03000. PHY-9221402. (CONF-930511–513: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94007397. Source: OSTI; NTIS; INIS; GPO Dep.

The betatron difference resonance, $Q_z - 2Q_z = -6$, where $Q_{x,z}$ are the number of betatron oscillations per turn, was studied at the Indiana University Cyclotron Facility (IUCF) cooler ring. The position of the beam was measured in both the horizontal and vertical planes of oscillation after a pulsed kicker magnet was fired to produce coherent motion. The effect of the coupling resonance was clearly observed and it was found that the subsequent particle motion could be described by a simple Hamiltonian. The resonance strength and tune shift as a function of betatron amplitude were measured.

12838 (FNAL/C–93/175) **Experimental results of the betatron sum resonance.** Wang, Y. (Indiana Univ., Bloomington, IN (United States)); Ball, M.; Brabson, B. Fermi National Accelerator Lab., Batavia, IL (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH03000. PHY-9221402. (CONF-930511–512: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94007396. Source: OSTI; NTIS; INIS; GPO Dep.

The experimental observations of motion near the betatron sum resonance, $\nu_x + 2\nu_z = 13$, are presented. A fast quadrupole (Panofsky-style ferrite picture-frame magnet with a pulsed power supplier) producing a betatron tune shift of the order of 0.03 at rise time of 1 μs was used. This quadrupole was used to produce betatron tunes which jumped past and then crossed back through a betatron sum resonance line. The beam response as function of initial betatron amplitudes were recorded turn by turn. The correlated growth of the action variables, J_x and J_z, was observed. The phase space plots in the resonance frame reveal the features of particle motion near the nonlinear sum resonance region.

12839 (FNAL/C–93/177) **Longitudinal tracking with phase and amplitude modulated rf.** Caussyn, D.D. (Indiana Univ., Bloomington, IN (United States)); Ball, M.; Brabson, B. Fermi National Accelerator Lab., Batavia, IL (United States). Jun 1993. 5p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH03000. PHY-9221402. (CONF-930511–514: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94007399. Source: OSTI; NTIS; INIS; GPO Dep.

Synchrotron motion was induced by phase shifting the rf of the Indiana University Cyclotron Facility (IUCF) cooler-synchrotron. The resulting coherent-bunch motion was tracked in longitudinal phase space for as many as 700,000 turns, or for over 350 synchrotron oscillations. Results of recent experimental studies of longitudinal motion in which the rf phase and amplitude were harmonically modulated are also presented. Comparisons of experimental data with numerical simulations, assuming independent particle motion, are made. Observed multiparticle effects are also discussed.

12840 (FNAL/C–94/019) **Beam dynamics issues at Fermilab.** Ng, King-Yuen. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310284–3: 6. advanced ICFA beam dynamics workshop, Madeira (Portugal), 24-30 Oct 1993). Order Number DE94007393. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the beam dynamics of the booster; transition crossing of the main ring; coupled-bunch instability; and snap coalescence.

12841 (FNAL/C–94/020) **Synchro-betatron effects in hadron machines.** Ng, King-Yuen. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310284–2: 6. advanced ICFA beam dynamics workshop, Madeira (Portugal), 24-30 Oct 1993). Order Number DE94007402. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics: synchro-betatron resonances; synchro-betatron effects; ground motion; current ripple; beam extraction; and phase diagram and chaos.

12842 (LAL-RT–93-03) **Multi-dimensional beam emittance and β-functions.** Buon, J. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. May 1993. 4p. (CONF-930511–: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE94618103. Source: OSTI; NTIS (US Sales Only); INIS.

The concept of r.m.s. emittance is extended to the case of several degrees of freedom that are coupled. That multi-dimensional emittance is lower than the product of the emittances attached to each degree of freedom, but is conserved in a linear motion. An envelope-hyperellipsoid is introduced to define the β-functions of the beam envelope. On the contrary of an one-degree of freedom motion, it is emphasized that these envelope functions differ from the amplitude functions of the normal modes of motion as a result of the difference between the Liouville and Lagrange invariants. (author) 4 refs.

12843 (LBL–35058) **Synchro-betatron resonances driven by the beam-beam interaction: Summary talk.** Furman, M.A. Lawrence Berkeley Lab., CA (United States). 12 Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9310284–1: 6. advanced ICFA beam dynamics workshop, Madeira (Portugal), 24-30 Oct 1993). Order Number DE94007035. Source: OSTI; NTIS; INIS; GPO Dep.

We present a selective summary of the discussions on beam-beam-driven synchrobetatron resonances at the 6th Advanced

ICFA Beam Dynamics Workshop on the subject "Synchro-Betatron Resonances," held in Funchal (Madeira, Portugal), October 24–30, 1993.

4303 Auxiliaries and Components

Refer also to citation(s) 12840, 12920, 12923, 12925, 12928, 12937, 12938, 12939, 12975, 12978, 12979, 12995, 13519, 13601, 13630, 13631, 13786, 14193, 14255

12844 (ANL/ASD/CP–81176) **Beam position feedback system for the Advanced Photon Source.** Chung, Y. Argonne National Lab., IL (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931254–1: Orbit analysis workshop, Upton, NY (United States), 1-3 Dec 1993). Order Number DE94006824. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Photon Source (APS) will implement both global and local beam position feedback systems to stabilize the particle and X-ray beams for the storage ring. The systems consist of 20 VME crates distributed around the ring, each running multiple digital signal processors (DSP) running at 4kHz sampling rate with a proportional, integral, and derivative (PID) control algorithm. The particle and X-ray beam position data is shared by the distributed processors through networked reflective memory. A theory of closed orbit correction using the technique of singular value decomposition (SVD) of the response matrix and simulation of its application to the APS storage ring will be discussed. This technique combines the global and local feedback systems and resolves the conflict among multiple local feedback systems due to local bump closure error. Maximum correction efficiency is achieved by feeding back the global orbit data to the local feedback systems. The effect of the vacuum chamber eddy current induced by the AC corrector magnet field for local feedback systems is compensated by digital filters. Results of experiments conducted on the X-ray ring of the National Synchrotron Light Source and the SPEAR at Stanford Synchrotron Radiation Laboratory will be presented.

12845 (ANL/EA/CP–81915) **Analysis of tritium production in the vicinity of Linac and LEB tunnels at the Superconducting Super Collider Laboratory.** Nabelssi, B.K. Argonne National Lab., IL (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940424–25: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94007643. Source: OSTI; NTIS; INIS; GPO Dep.

Monte Carlo calculations were performed to estimate the tritium production in groundwater around the Linear Accelerator (Linac) and the Low Energy Booster (LEB) tunnels at the Superconducting Super Collider Laboratory (SSCL). The calculations were performed using the new version of the Los Alamos High Energy Transport (LAHET) code system (SUPERHET). Most of the tritium activity was found to occur in a zone extending 2 m from the tunnel wall. The calculated tritium production rate was used to derive the. maximum allowable beam losses that would result in an average groundwater concentration in the activation zone of 20 pCi/cm^3, the federal maximum contaminant level (MCL) for tritium in drinking water. The maximum allowable beam losses were found to be about 4% and 2% of the maximum operating be.-un for the Linac at 1 GeV and the LEB at 11 GeV, resnectively. These percentages are well in excess of typical operational losses at existing highenergy accelerators. The results are in good agreement with previously reported calculations. Tritium saturation activity in water pipes resultina, from the derived maximum allowable beam loss was found to be 355 pCi/cm^3 in the Linac operating at 600 MeV and 363 pCi/cm^3 in the LEB operating at 11 GeV. Accidental tritium releases from water pipes were found to cause an inhalation dose rate of less than 0.013 (Linac at 600 MeV) and 0.009 mrem/hr (LEB at 11 Gev) in the tunnels. These dose rates are well within the laboratory's design limit of 0.1 mrem/hr for controlled areas. Accidental beam losses were found to cause activation in excess of the MCL only after an irradiation time of more than 557 hours in the Linac at 600 MeV and 69 hours in the LEB at 11 GeV. A full-beam accident lasting more than one hour is considered unlikely.

12846 (BNL–52389, pp. 118-129) **The technical issues of neutrino beams.** Malensek, A.J. (Fermi National Lab., Batavia, IL (United States)); Beveridge, J.L.; Helmer, R.L. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Even though the energies and intensities are different by orders of magnitude at LAMPF, BNL, FERMILAB, and TRIUMF, the technical issues faced by designers of neutrino beams are similar, and all push the current technology. The major issues are delineated, and a list of parameters for each facility are given.

12847 (BNL–52389, pp. 380-383) **Future facilities for high-resolution (π, K) and other pion reactions at 1 GeV.** Thiessen, H.A. (Los Alamos National Lab., NM (United States)); Zumbro, J.D. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

In 1991, the LAMPF Users considered a facility based on a pion linac (PILAC) to provide pions of up to 1 GeV for (π, K) and other pion reactions at LAMPF. The authors have extended this proposal to a version appropriate for high-energy proton accelerators by raising the pion injection energy and shortening the pion linac so that it is used as a rf separator and bunch rotator (SCRUNCHER). The authors have then estimated the yield of pions on target expected at LAMPF (PILAC), LAMPF assuming a proton energy upgrade to 2 GeV at 1 mA, the proposed KAON facility at TRIUMF, the Brookhaven AGS with booster, and the Fermilab Main Injector.

12848 (BNL–52389, pp. 390-394) **Low energy $\bar{p}$ for hadron spectroscopy.** Peaslee, D.C. (Univ. of Maryland, College Park, MD (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A pure $\bar{p}$ beam with good resolution has ideal features for light quark hadron spectroscopy in the mass region 2.2 - 3.5 GeV, corresponding to p_L = 1.35 - 5.50 GeV against a fixed target. About 85% of this range lies beyond the limit of LEAR; the most economical access - in time as well as money - can be provided without major new construction by a system based on the BNL Booster.

12849 (BNL–52389, pp. 557-562) η **Production at the LAMPF P^3 channel.** Zumbro, J.D. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The author discusses the pion flux that would be available at the P^3 channel at LAMPF with modifications to east leg of the channel. Modifications involve tayloring the optics of the channel to match the pion beam into a section of superconducting linac in both traverse dimensions and also longitudinally. The performance of this channel with these modification is discussed. The possible η flux with this channel is also discussed.

12850 (BUDKERINP–92-35) **Superconducting final focusing quad for linear collider.** Kushnirenko, E.A.; Mikhajlichenko, A.A.; Seryj, A.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 8p. Order Number DE94618108. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility to fabricate and to use an ironless quad with superconducting winding in the final focusing system for next generation of the Linear Collider is reviewed in this paper. The quad's total diameter (including thermoinsulation layer) will be as small as about 4 cm. Small transverse size of this lens will allow to increase

significantly the solid angle covered by the detector and to decrease the background arisen because of interaction of the high energy particles with the lens and accelerator details. The estimations have confirmed that creation of the ironless superconducting lens with gradient up to 300 kGs/cm is possible. This value of gradient is quite enough for focusing of the beam with energy up to 1 TeV. 8 refs.; 3 figs.

12851 (CEA-CONF–11441) **Improving superconducting RF technology for high energy particle accelerators.** Leconte, P. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee. 1991. 6p. (CONF-910835–: European Physical Society (EPS) nuclear physics conference on hadronic structure and electromagnetic interactions, Amsterdam (Netherlands), 5-10 Aug 1991). Order Number DE94618109. Source: OSTI; NTIS (US Sales Only); INIS.

A review of the state of the art is given. It shows recent proofs of success of the technology. An important R and D effort remains to be done in order to collect all the expectable benefits of RF superconductivity. (author).

12852 (CONF-9310290–1) **Ion sources for initial use at the Holifield Radioactive Ion Beam Facility.** Alton, G.D. Oak Ridge National Lab., TN (United States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Workshop on postacceleration issues at the IsoSpin Laboratory (ISL); Berkeley, CA (United States); 27-29 Oct 1993. Order Number DE94007220. Source: OSTI; NTIS; INIS; GPO Dep.

The Holifield Radioactive Ion Beam Facility (HRIBF) now under construction at the Oak Ridge National Laboratory will use the 25-MV tandem accelerator for the acceleration of radioactive ion beams to energies appropriate for research in nuclear physics; negative ion beams are, therefore, required for injection into the tandem accelerator. Because charge exchange is an efficient means for converting initially positive ion beams to negative ion beams, both positive and negative ion sources are viable options for use at the facility; the choice of the type of ion source will depend on the overall efficiency for generating the radioactive species of interest. A high-temperature version of the CERN-ISOLDE positive ion source has been selected and a modified version of the source designed and fabricated for initial use at the HRIBF because of its low emittance, relatively high ionization efficiencies and species versatility, and because it has been engineered for remote installation, removal and servicing as required for safe handling in a high-radiation-level ISOL facility. Prototype plasma-sputter negative ion sources and negative surface-ionization sources are also under design consideration for generating negative radioactive ion beams from high-electron-affinity elements. The design features of these sources and expected efficiencies and beam qualities (emittances) will be described in this report.

12853 (FNAL-TM–1825) **Spectrometer beam tube dimensional optimization.** Dye, S. Fermi National Accelerator Lab., Batavia, IL (United States). 4 Jan 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94007272. Source: OSTI; NTIS; INIS; GPO Dep.

This project examined the optimization of the design of a beam tube. An ANSYS model was used to find the minimum tube thickness and the best camber in a beam tube under vacuum and preloaded by a pair of magnet poles. After the tube was modeled one version of it was built for use in the accelerator. This beam tube was put under a vacuum and the dimensional changes were recorded and compared to the ANSYS predictions. These deflection results were quite close to the predicted numbers and would suggest that the stresses are similar to the predictions as well.

12854 (INS–993) **ECR ion source development at INS.** Sekiguchi, M.; Ohshiro, Y.; Yamashita, Y.; Isoya, Y.; Hattori, T.; Kitagawa, A. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jul 1993. 11p. (CONF-9305239–: 11. international workshop on electron resonance ion sources, Groningen (Netherlands), 5-8 May 1993). Order Number DE94748500. Source: OSTI; NTIS; INIS.

Four ECR ion sources for multiply-charged heavy ions have been developed at INS in collaboration with other laboratories. Their characteristics and performance are reviewed together with their present status. (author).

12855 (INS–994) **Emittance measurement at HyperECR.** Yamashita, Y. (Japan Steel Works Ltd., Tokyo (Japan)); Isoya, Y.; Sekiguchi, M. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jul 1993. 4p. Order Number DE94748501. Source: OSTI; NTIS; INIS.

An emittance scanner has been installed in the beam line of the HyperECR ion source. It takes about 4 min to measure the emittance for the horizontal and vertical directions. Typical 90 % emittance was measured to be about 160 πmm·mrad in the horizontal direction and 200 πmm·mrad in the vertical direction in the case of 100 eμA of Ar^{8+} at 20 kV extraction voltage. Dependence of the emittance on the extraction voltage, the charge state of the ions, the beam current and the diameter of the extraction hole was measured. (author).

12856 (INS–995) **Effects of gas mixing and electron injection in production of multiply-charged ion with the HyperECR.** Yamashita, Y. (Japan Steel Works Ltd., Tokyo (Japan)); Isoya, Y.; Ishida, T.; Sekiguchi, M. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Jul 1993. 4p. Order Number DE94748502. Source: OSTI; NTIS; INIS.

In an experiment by using the gas mixing technique and electron beam injection technique at a multiply-charged heavy ion source (HyperECR) with 14.25 GHz microwave frequency, an enhancement of the intensity for highly charged ions has been observed. It was confirmed that these methods work well also in this source. (author).

12857 (IYaF–91-43) **Study on SHF ferrites under conditions of operation of frequency-retuned resonators.** Averbukh, I.I.; Dovgerd, P.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 11p. (In Russian). Order Number DE94616176. Source: OSTI; NTIS (US Sales Only); INIS.

SHF ferrites in conditions of simultaneous action of HF magnetization fields are investigated. It is established that for deep magnetization the quality factor of ferrite garnets in a HF field has the value of more 2000. 5 refs.

12858 (IYaF–92-62) **Shielding of a detector from synchrotron radiation background in the 6,5x4,3 GeV asymmetric B-factory.** Blinov, V.E. (and others); Zholents, A.A.; Lebedev, V.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 40p. (In Russian). Order Number DE94616201. Source: OSTI; NTIS (US Sales Only); INIS.

A scheme for synchrotron radiation shielding in the final focus of the asymmetric B factory. Effects on the edge of radiation detectors are investigated. Photon flux in a vertex detector is $2x10^6$ photon/nc.

12859 (JAERI-M–93-241) **JAERI TIARA annual report vol. 2 (1992): April 1992 - March 1993.** Ishigaki, Isao (Japan Atomic Energy Research Inst., Takasaki, Gunma (Japan). Takasaki Radiation Chemistry); Tanaka, Ryuichi; Nashiyama, Isamu; Naramoto, Hirosi; Omichi, Hideki; Toraishi, Akio; Watanabe, Hiromasa; Watanabe, Hiroshi (eds.). Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1993. 273p. Order Number DE94748689. Source: OSTI; NTIS; INIS.

This annual report describes research activities which have been performed with the JAERI TIARA (Takasaki Ion Accelerators for Advanced Radiation Application) facilities from April 1, 1992 to March 31, 1993. Summary reports of 60 papers and brief descriptions on status of TIARA in the period are contained. A list of publications, the type of research collaborations and organization of TIARA are also given as appendices. (author).

12860 (JINR–2-93-59, pp. 53-55) **The first run with ^{32}S relativistic nuclei at the Laboratory of High Energies accelerating facility in Dubna.** Kovalenko, A.D. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Agapov, N.N.; Adfeev, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications:*

Collection. 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The acceleration of ^{32}S nuclei were first performed at the accelerating facility of LHE. The cryogenic electron-beam ionizer KRION-S was used as a source of ions. The control system of the ionizer was based on fiber-optical communication links and a PC/X computer. The number of particles captured in the acceleration mode was $(2.2+2.5)\times10^5$ 1/cycle. The stacks of plastic track detectors and photoemulsion chambers were exposed at an energy of 3.65 GeV/u. refs.2.

12861 (JINR–13-93-219) **Automatic module system for control of an ion source 'Cryon-S'.** Ovsyannikov, V.P.; Reznikov, S.G.; Romanov, Yu.I.; Tsarenkov, A.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. 12p. (In Russian). Order Number DE94618105. Source: OSTI; NTIS (US Sales Only); INIS.

The automatic module system for control of an ionizer 'Cryon-S' using fiber optics links and PC/XT is described. Brief technical characteristics of basic and service optical systems used in the first run for acceleration of nuclei sulfur on the synchrophasotron of the Laboratory of High Energies (L.H.E.) from the electron beam ion source 'Cryon-S' are presented. 26 refs.; 5 figs.

12862 (JINR-E–9-93-273) **Cryogenic system of the nuclotron - a new superconducting synchrotron.** Baldin, A.M. (and others); Agapov, N.N.; Belushkin, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. 8p. Order Number DE94618110. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Cryogenic Engineering Conference, 12-16 July 1993, Albuquerque, USA.

The superconducting relativistic heavy ion accelerator was commissioned the last week of March in Dubna, and the first deuteron beam was circulated in the ring. The total cold mass of the magnetic system is about 80 tons. The magnet with a 'cold' iron yoke and a hollow superconductor winding is refrigerated by a two-phase helium flow. All 160 magnets are connected in parallel with supply and return helium headers about 250 meters long. The cryogenic supply system is based on three helium refrigerators with a total capacity of 4.8 kW at 4.5 K. The results on the commissioning of the cryogenic system are presented. 11 refs.; 5 figs.; 1 tab.

12863 (KEK–93-1) **Progress report on B physics task force activities, 1992.** National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1993. 192p. Order Number DE94748636. Source: OSTI; NTIS; INIS.

This document summarizes the results of the studies on physics and detector at the proposed KEK B-factory made over the past one year. A considerable amount of studies were done prior to the last year on the Monte Carlo simulations of CP violating processes and an optimization of the detector for those processes [1,2]. These studies resulted in a conceptual design of the detector. Chapter 2 summarizes the configuration and expected performances of the proposed detector. Chapter 3 summarizes expected sensitivities of the detector to CP violation parameters. Chapter 4 describe mostly new results from our detector R and D effort. Status of the full simulation development is described in Chapter 5. What are the requirements on the momentum resolution and K/π separation for comprehensive studies of CP violation processes remain to be an unresolved issue. With a decision to use VENUS solenoid, we can obtain at most 1.0 Tesla. Even though all of our previous studies were done with this magnetic field and we have been convinced that 1.0 Tesla is adequate for measurements of most processes, we need to do these studies in conjunction with the other detectors such as K/π separation device. A good K/π separation above 1 GeV/c requires some types of Cherenkov counter. Construction of any of these devices is technically demanding and we need to examine its necessity carefully. This argument is given in Chapter 6. (J.P.N.) 72 refs.

12864 (KEK–93-3) **Magnetic field measurements and data acquisition of a model magnet for the B-factory.** Zhou Wenming; Endo, Kuninori. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). May 1993. 18p. Order Number DE94748552. Source: OSTI; NTIS; INIS.

In this paper we describe magnetic field measurements and the field data-acquisition system used to measure the model magnet for the B-factory booster. The results of the measurements indicate that the method adopted here is good for acquiring field data. This type of measurement is highly accurate and involves almost no temperature coefficient. The instrument is used not only for ac, but also dc field measurements. It is especially good for field measurements in the case of simultaneous ac and dc field excitation. (author).

12865 (KEK–93-4) **Development of the rf system at the KEK Proton Synchrotron.** Ninomiya, Shigeshi; Takano, Susumu; Yoshii, Masato; Toda, Makoto. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). May 1993. 46p. Order Number DE94748551. Source: OSTI; NTIS; INIS.

The improvement of the KEK-PS RF system is explained. The feedback loops in the rf system and the bunch motion are described in terms of control theory. Recent operation of the rf system is also summarized. (author).

12866 (KEK–93-6) **The computer simulation of the resonant network for the B-factory model power supply.** Zhou, W.; Endo, K. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Jul 1993. 6p. Order Number DE94748549. Source: OSTI; NTIS; INIS.

A high repetition model power supply and the resonant magnet network are simulated with the computer in order to check and improve the design of the power supply for the B-factory booster. We put our key point on a transient behavior of the power supply and the resonant magnet network. The results of the simulation are given. (author).

12867 (KEK–93-7) **Lecture note on digital circuit design for high energy physics experiment.** Ikeda, Hirokazu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. 99p. Order Number DE94748548. Source: OSTI; NTIS; INIS.

This lecture gives basic ideas and practice of the digital circuit design for high energy physics experiment. The lecture has a special emphasis on a simulation study with a hardware description language. The student could complete a design of a simple RISC based computer after finishing this course. (author).

12868 (KEK–93-8) **Physics with primary beams of the KEK-PS.** Tanaka, Kazuhiro; Yoshii, Masahito (eds.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. 124p. (In Japanese). Order Number DE94748635. Source: OSTI; NTIS; INIS.

The 12-GeV Proton Synchrotron (PS) at the National Laboratory for High Energy Physics (KEK) has provided great opportunities to high-energy-physics and related communities as a unique high-energy hadron machine, since its operation in 1976. Activities of the KEK-PS are indispensable for the rapid development in the field. Six experimental subjects are proposed in this Report; (1) media effects in ϕ meson decay, (2) multifragmentation in high-energy reactions, (3) mechanism of high-energy reactions by means of radio-chemical methods, (4) physics with polarized high-energy neutrons, (5) physics with polarized high-energy deuterons, and (6) hypernucleus with high-energy heavy-ion beams. As a summary, new facilities (a new injector, a new beamline and a new experimental area) and physics programs with primary beams, proposed in this Report are themselves unique and valuable. Moreover, technical developments and physics outcomes stimulated with those new facilities are indispensable for future plans of the KEK-PS. (J.P.N.).

12869 (KEK-PR–93-1) **Photon factory activity report, 1992.** National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). 1993. 642p. Order Number DE94748682. Source: OSTI; NTIS; INIS.

This issue is the annual report of the Photon Factory, National laboratory of High Energy Physics. First, the outline of the Photon Factory is presented. Injector linac, light source, beamlines and instrumentation, the Tristan synchrotron radiation facility at the accumulation ring, and the Tristan super light facility are described in detail. The facility is open to researchers. The user's reports are collected as well. (J.P.N.) (435 refs.).

12870 (KEK-PROC–92-15, pp. 1-6) **A users view of the SPS and LEP control systems.** Bailey, R. (European Organization for Nuclear Research, Geneva (Switzerland)). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Every accelerator has a control system; at present the SPS has two, both of which are needed to run the machine. Consequently a user of the SPS/LEP complex has to be concurrently familiar with three control systems. While this situation brings problems it allows, even forces, comparison between the different systems, which in turn enriches the user viewpoint. This paper assesses the SPS and LEP control systems from the point of view of the user, who may be an equipment specialist, operator, accelerator physicist or combinations thereof. (author).

12871 (KEK-PROC–92-15, pp. 7-10) **Experience controlling the LAMPF-PSR accelerator complex.** Schaller, S. (Los Alamos National Lab., NM (United States)); Stuewe, R.; Bjorklund, E. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

In recent years, control system efforts at LAMPF have emphasized the provision of uniform control for the LAMPF linear accelerator and associated beam lines and the Proton Storage Ring and its associated beam lines. The situation is complicated by the presence of several control philosophies in the operator interfaces, data base mechanisms, and front end data acquisition and control interfaces. This paper describes the current system configuration, including the distributed operator interfaces, the data and control sharing between systems, and the use of common accelerator diagnostic software tools. Successes as well as deficiencies of the present system will be discussed with an eye toward future developments. (author).

12872 (KEK-PROC–92-15, pp. 11-13) **Status report on the ADVANCED LIGHT SOURCE control system.** Magyary, S. (Lawrence Berkeley Lab., CA (United States)); Chin, M.; Fahmie, M.; Lancaster, H.; Molinari, P.; Robb, A.; Timossi, C.; Young, J. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

This paper is a status report on the ADVANCED LIGHT SOURCE (ALS) control system. The current status, performance data, and future plans will be discussed. Manpower, scheduling, and costs issues are addressed. (author).

12873 (KEK-PROC–92-15, pp. 14-18) **Lessons from the SLC for future LC control systems.** Humphrey, R. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The SLC control system is the dynamic result of a number of forces. The most obvious force is the functional requirements of the SLC itself, but other forces are history, budget, people, available technology, etc. The plan of this paper is to describe the critical functional requirements of the SLC which caused significant development of the control system. I have tried to focus on functional requirements as a driver, and I will describe some solutions which we have implemented to satisfy those requirements. The important functional requirements drivers for the control system discussed in this paper are: (1) Repetition rate, (2) Sensitivity to orbit distortion, (3) Stability/Automation, (4) Accelerator Development. (author).

12874 (KEK-PROC–92-15, pp. 19-22) **Process control for the Vivitron: the generator test set-up.** Lutz, J.R. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Marsaudon, J.C.; Baumann, R.; Kapps, E.; Knaebel, R.; Persigny, J. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The VIVITRON is a 35 MV Van de Graaff tandem electrostatic accelerator under construction at the CRN since 1985. About half of the parameters are controlled by equipments which are highly stressed by their physical environment: sparks, electrostatic field, X-rays, vacuum, and gas pressure. It needs a dedicated process control system. The described control system is used since early 1991 to perform the voltage tests of the generator. It provides important information for the accelerator tuning and for the full size control under development. (author).

12875 (KEK-PROC–92-15, pp. 23-26) **Recent developments of the ALPI control system.** Bassato, G. (Istituto Nazionale di Fisica Nucleare, Legnaro (Italy)); Battistella, A.; Bellato, M.; Canella, S. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

This paper presents recent developments of the control system for ALPI, the new superconducting linear accelerator that will begin to operate at L.N.L. next year. Both hardware and software architectures are described and some base choices are discussed. Results of tests performed in the last two years are also reported. (author).

12876 (KEK-PROC–92-15, pp. 27-30) **The GSI control system.** Krause, U. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Schaa, V.; Steiner, R. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The GSI accelerator facility consists of an old linac and two modern machines, a synchrotron and a storage ring. It is operated from one control room. Only three operators at a time have to keep it running with only little assistance from machine specialists in daytime. So the control tools must provide a high degree of abstraction and modeling to relieve the operators from details on the device level. The program structures to achieve this are described in this paper. A coarse overview of the control architecture is given. (author).

12877 (KEK-PROC–92-15, pp. 31-34) **VME applications to the Daresbury SRS control system.** Martlew, B.G. (Daresbury Lab., Warrington (United Kingdom)); McCarthy, M.; Rawlinson, W.R. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The control system for the Daresbury SRS has recently been extended with a VME based alarm system which is operational. A further development is a steering system to provide servo control of the electron beam orbit position in the storage ring. (author).

12878 (KEK-PROC–92-15, pp. 35-39) **Accelerator control systems in China.** Yao Chihyuan (China Univ. of Science and Technology, Hefei, AH (China). Hefei Synchrotron Radiation Lab.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Three accelerator facilities were built in the past few years, the 2.8 GeV electron positron collider BEPC, the heavy ion SSC cyclotron accelerator HIRFL and the 800 MeV synchrotron radiation storage ring HESYRL. Aimed at different research areas, they represent a new generation of accelerator in China. This report describes the design philosophy, the structure, performance as well as future improvements of the control systems of the these facilities. (author).

12879 (KEK-PROC–92-15, pp. 44-46) **The control system of HIRFL.** Jiao Tianshu (Academia Sinica, Lanzhou, GS (China). Inst. of Modern Physics); Li Tianyou; Ma Siwen; Chu Zhensheng; Huang Tuanhua; Zhou Xun; Wang Zhen; Shen Zhiqing. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Short communication. HIRFL CYCLOTRON/control systems; HEAVY IONS; BEAM TRANSPORT; OPERATION; COMPUTERS; CONSOLES; COMPUTER NETWORKS; COMPUTER ARCHITECTURE; CAMAC SYSTEM; IBM COMPUTERS

12880 (KEK-PROC–92-15, pp. 47-49) **Control system for a heavy-ion accelerator complex K4 - K10.** Kotov, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation)); Pose, R. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Control systems for newly created accelerators, perhaps for the first time, may be designed almost only around international standards for communication and control techniques. This is also true for the project of a control system for the accelerator complex K4-K10 at the Joint Institute for Nuclear Research Dubna. Nevertheless, open systems architecture with construction principles being essential for modern systems of such big devices as particle accelerators leaves designers enough possibilities for solving even very sophisticated problems. (author).

12881 (KEK-PROC–92-15, pp. 50-53) **Future directions in controlling the LAMPF-PSR accelerator complex at Los Alamos National Laboratory.** Stuewe, R. (Los Alamos National Lab., NM (United States)); Schaller, S.; Bjorklund, E. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Four interrelated projects are underway whose purpose is to migrate the LAMPF-PSR Accelerator Complex control systems to a system with a common set of hardware and software components. Project goals address problems in performance, maintenance and growth potential. Front-end hardware, operator interface hardware and software, computer systems, network systems and data system software are being simultaneously upgraded as part of these efforts. The efforts are being coordinated to provide for a smooth and timely migration to a client-server model-based data acquisition and control system. An increased use of distributed intelligence at both the front-end and the operator interface is a key element of the projects. (author).

12882 (KEK-PROC–92-15, pp. 54-58) **Common control system for the CERN accelerators.** Rausch, R. (European Organization for Nuclear Research, Geneva (Switzerland)); Serre, Ch. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The PS and SPS Accelerator Control Systems are becoming obsolete and need urgent rejuvenation. After a control users forum, where users expressed their needs, two main Working Groups were set up, consisting of Control and Equipment Specialists and experienced Machine Operators. One Working Group studied the architecture and the front-end processing and the other a common approach to the application software needed to run the CERN accelerator complex. The paper presents the technical conclusion of their work and the policy to implement it, taking into account the necessity to operate both machines without interruption of the Physics Program. (author).

12883 (KEK-PROC–92-15, pp. 59-64) **New control architecture for the SPS accelerator at CERN.** Kissler, K.H. (European Organization for Nuclear Research, Genava (Switzerland)); Rausch, R. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The Control System for the 450 Gev proton accelerator SPS at CERN was conceived and implemented some 18 years ago. The 16 Bit minicomputers with their proprietary operating system and interconnection with a dedicated network do not permit the use of modern workstations, international communication standards and industrial software packages. The upgrading of the system has therefore become necessary. After a short review of the history and the current state of the SPS control system, the paper describes how CERN's new control architecture, which will be common to all accelerators, will be realized at the SPS. The migration path ensuring a smooth transition to the final system is outlined. Once the SPS upgrade is complete and following some enhancements to the LEP control system, the operator in the SPS/LEP control center will be working in a single uniform control environment. (author).

12884 (KEK-PROC–92-15, pp. 65-70) **The next generation control system of GANIL.** Luong, T.T. (Grand Accelerateur National d'Ions Lourds (GANIL). 14-Caen (France)); David, L.; Lecorche, E.; Ulrich, M. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The existing computer control system of GANIL is being renewed to fulfil the increasing requirements of the accelerator operation. This medium term major improvement is aiming at providing the physicists with a wider range of ion beams of higher quality under more flexible and reliable conditions. This paper gives a short description of the new control system envisioned. It consists of a three layer distributed architecture federating a VAX6000-410/VMS host computer, a real time control system made up of a dual host VAX3800 and workstation based operator consoles, and at the frontend segment: VME and CAMAC processors running under the VAXELN operating system, and programmable logic controllers for local controls. The basic issues with regard to architecture, human interface, information management, ... are discussed. Lastly, first implementations and operation results are presented. (author).

12885 (KEK-PROC–92-15, pp. 71-77) **Replacement of the ISIS control system.** Mannix, R.P. (Rutherford Appleton Lab., Oxford (United Kingdom)); Barton, C.J.; Brownless, D.M.; Kerr, J.C. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan).

Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

In operation since 1985, ISIS is the world's most powerful pulsed spallation neutron source. The decision has been taken to replace the existing ISIS control system, which has been in use for over ten years. The problems of such a project, given the legacy of processor specific hardware and software are discussed, a long with the problems associated with incorporating existing interface hardware into any new system. Present progress using commercial workstation based control software is presented with, an assessment of the benefits and pitfalls of such an approach. (author).

12886 (KEK-PROC–92-15, pp. 78-81) **Upgrading the control system for the Accelerators at the Svedberg Laboratory.** Gajewski, K.J. (The Svedberg Lab., Uppsala (Sweden)); Thuresson, L.; Johansson, O. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

Two accelerators at The Svedberg Laboratory in Uppsala, the Gustaf Werner cyclotron and the CELSIUS ring, will get a new control system. At present both the cyclotron and the ring have their own control systems based on S99 and PDP-11 minicomputers respectively. There are also a number of subsystems which are controlled separately from the stand-alone PC based consoles (ECR ion source, electron cooler, vacuum system). The goal of the rejuvenation is to integrate all existing control systems and provide the new system with an uniform operators interface based on workstations. The obsolete S99 microcomputers will be substituted with a VME system and all subsystems will be connected to the Ethernet. The upgrade strategy enabling the transformation of the system without any long shut-down period is discussed. Hardware and software planned for the upgrade is presented together with a discussion of expected problems. (author).

12887 (KEK-PROC–92-15, pp. 82-84) **Upgrading the BEPC control system.** Yang Liping (Academia Sinica, Beijing, BJ (China). Inst. of High Energy Physics); Wang Lizheng; Liu Shiyao. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The BEPC control system has been put into operation and operated normally since the end of 1987. Three years's experience shows this system can satisfy basically the operation requirements, also exhibits some disadvantages araised from the original centralized system architecture based on the VAX-VCC-CAMAC, such as slow response, bottle neck of VCC, less CPU power for control etc.. This paper describes the method and procedure for upgrading the BEPC control system which will be based on DEC net and DEC-WS, and thus intend to upgrade the control system architecture from the centralized to the distributed and improve the integral system performance. (author).

12888 (KEK-PROC–92-15, pp. 89-92) **Upgrade plan for the control system of the KEK e^-/e^+ linac.** Furukawa, K. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Kamikubota, N.; Nakahara, K.; Abe, I. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The KEK 2.5-GeV linac has been operating since 1982. However, in order to maintain reliable operation, the control system should be upgraded within a few years. We plan to replace the minicomputers and the main network connecting them. Thus, the architecture of the control software will also be revised. In the new system we should adopt software and hardware standards. In the next control system we will employ the TCP/IP (DARPA) protocol suite for the main network and Unix workstations to replace the minicomputers. For connections to the local controllers, VME bus (IEEE 1014) will be utilized. (author).

12889 (KEK-PROC–92-15, pp. 93-95) **The new control system for TARN-2.** Watanabe, S. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study); Yoshizawa, M.; Yoshizawa, J.; Katayama, T.; Aoki, K.; Ohnishi, K. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The new control system for the cooler-synchrotron. TARN-2, is described. The new control system consists of OPU's (work stations) and EXU (control computer) linked with the local area network. The text message is used to transfer the control commands and their results. The control program CSA90 at EXU decodes the text message and executes it with the aid of the interface and periodic control subroutines. Both subroutines use common sharable image composed of the status, values, parameters and so on. The CAMAC, GPIB and RS232C are standard interface at EXU. (author).

12890 (KEK-PROC–92-15, pp. 96-99) **A new architecture for Fermilab's cryogenic control system.** Smolucha, J. (Fermi National Accelerator lob., Batavia, IL (United States)); Frank, A.; Seino, K.; Lackey, S. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

In order to achieve design energy in the Tevatron, the magnet system will be operated at lower temperatures. The increased requirements of operating the Tevatron at lower temperatures necessitated a major upgrade to the both the hardware and software components of the cryogenic control system. The new architecture is based on a distributed topology which couples Fermilab designed I/O subsystems to high performance, 80386 execution processors via a variety of networks including: Arcnet, iPSB, and token ring. (author).

12891 (KEK-PROC–92-15, pp. 100-104) **Controls for the CERN large hadron collider (LHC).** Kissler, K.H. (European Organization for Nuclear Research, Geneva (Switzerland)); Perriollat, F.; Rabany, M.; Shering, G. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

CERN's planned large superconducting collider project presents several new challenges to the Control System. These are discussed along with current thinking as to how they can be met. The high field superconducting magnets are subject to 'persistent currents' which will require real time measurements and control using a mathematical model on a 2-10 second time interval. This may be realized using direct links, multiplexed using TDM, between the field equipment and central servers. Quench control and avoidance will make new demands on speed of response, reliability and surveillance. The integration of large quantities of industrially controlled equipment will be important. Much of the controls will be in common with LEP so a seamless integration of LHC and LEP controls will be sought. A very large amount of new high-tech equipment will have to be tested, assembled and installed in the LEP tunnel in a short time. The manpower and cost constrains will be much tighter than previously. New approaches will have to be

found to solve many of these problems, with the additional constraint of integrating them into an existing frame work. (author).

12892 (KEK-PROC–92-15, pp. 105-109) **A performance requirements analysis of the SSC control system.** Hunt, S.M. (Superconducting Super Collider Lab., Dallas, TX (United States)); Low, K. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

This paper presents the results of analysis of the performance requirements of the Superconducting Super Collider Control System. We quantify the performance requirements of the system in terms of response time, throughput and reliability. We then examine the effect of distance and traffic patterns on control system performance and examine how these factors influence the implementation of the control network architecture and compare the proposed system against those criteria. (author).

12893 (KEK-PROC–92-15, pp. 110-115) **The computer control system for the CESR B factory.** Strohman, C.R. (Cornell Univ., Ithaca, NY (United States). Lab. of Nuclear Studies); Rice, D.H.; Peck, S.B. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

B factories present unique requirements for controls and instrumentation systems. High reliability is critical to achieving the integrated luminosity goals. The CESR-B upgrade at Cornell University will have a control system based on the architecture of the successful CESR control system, which uses a centralized database/massage routing system in a multiported memory, and VAX stations for all high-level control functions. The implementation of this architecture will address the deficiencies in the current implementation while providing the required performance and reliability. (author).

12894 (KEK-PROC–92-17) **Proceedings of the workshop on negative ion formation and beam handling.** Takagi, A.; Mori, Y. (eds.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Jan 1993. 182p. (In Japanese, English). (CONF-9207233– : Workshop on negative ion formation and beam handling, Tsukuba (Japan), 27-28 Jul 1992). Order Number DE94748683. Source: OSTI; NTIS; INIS.

The Workshop on Negative Ion Formation and Beam Handling was held at National Laboratory for High Energy Physics (KEK) on July 27 and 28. More than 40 participants attended the workshop. Negative ions and beams are becoming very useful and attractive in many fields of science, in particular in accelerator science and nuclear fusion and various types of negative ion sources have been developed so far. However, the fundamental mechanisms of negative ion generation in the ion sources and of beam formation are still not clear. This workshop aimed to discuss the problems on these points in details. (J.P.N.).

12895 (KEK-PROC–93-1) **Proceedings of the SLAC/KEK ATF lattice workshop.** Urakawa, Junji (ed.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1993. 96p. (CONF-9212113–: SLAC/KEK ATF lattice workshop, Taukuba (Japan), 8-11 Dec 1992). Order Number DE94748546. Source: OSTI; NTIS; INIS.

The SLAC/KEK ATF Lattice Workshop was held on December 8-11, 1992 at KEK, National Laboratory for High Energy Physics. The purpose of this workshop is to critically review the ATF lattice design for any possible improvements, and also to bring SLAC colleagues up to date on recent progress at KEK. At KEK studies on intense multi-bunch beam acceleration and emittance reduction have been actively pursued, evolving into the ATF project since 1990. In 1991 we have launched a large scale reconstruction of the experimental hall. This is to build the shielded housing for the 1.54 GeV injector linac and the test damping ring. Our plan is to begin construction of the linac in March 1993. Some results from the discussions during the Workshop have been already incorporated in the revised ATF lattice design. (J.P.N.).

12896 (KEK-PROC–93-5) **Proceedings of the workshop on the PS-spin collider.** Mori, Yoshiharu (ed.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). May 1993. 114p. (In Japanese, English). (CONF-9201171–: Workshop on the PS-spin collider, Tsukuba (Japan), 31 Jan - 1 feb 1992). Order Number DE94748547. Source: OSTI; NTIS; INIS.

This volume is a record of the PS-Spin Collider Workshop which was held at KEK, Jan. 31-Feb.1, 1992. As a future project of the KEK 12-GeV proton synchrotron (KEK-PS), the hadron collider (PS-Collider), has been under discussion. Originally, the PSC was designed for heavy ion beam collisions with the energy range of 5-7 GeV/u. If polarized protons are accelerated in PSC, 19 x 19 GeV collisions are possible. This workshop was proposed to bring together interested experimentalists and accelerator physicists to discuss the case that could be made for polarization physics and the technical feasibility at the PS Spin Collider. More than 30 physicists participated in the workshop and very interesting and useful discussions took place. (author).

12897 (KEK-PROC–93-6) **Proceedings of JLC-FFIR92.** Tauchi, Toshiaki; Yamamoto, Noboru (eds.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Jun 1993. 619p. (In Japanese, English). (CONF-9211291–: JLC-FFIR92: Japan linear collider-final focus interaction region workshop, Higashiizu (Japan), 25-27 Nov 1992). Order Number DE94748553. Source: OSTI; NTIS; INIS.

This publication is the collection of hand-outs and transparencies presented at the JLC-FFIR (Japan Linear Collider-Final Focus Interaction Region) Workshop. There were 38 participants and 18 presentations. (J.P.N.).

12898 (KEK-PROC–93-13) **International workshop on emittance preservation in linear colliders: Emittance93.** Urakawa, Junji; Oide, Katsunobu (eds.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Sep 1993. 713p. (CONF-930477–: International workshop on emittance preservation in linear colliders, Tsukuba (Japan), 16-23 Apr 1993). Order Number DE94748637. Source: OSTI; NTIS; INIS.

The extremely low emittances, which are the essential feature for any linear collider, are far beyond those of the present high-energy accelerators. Every part of the linear-collider accelerator complex is liable to blow up them to a fatal degree. Above all, the main linac is the most critical part, since it will have an unprecedented length, through which very highly populated bunches should be accelerated without a faint increase of emittances. A lot of efforts have been paid, mainly theoretically, to settle this problem at all institutes. Any convincing conclusions are not yet reached. Furthermore, there are six approaches of substantially different schemes (Tesla, DLC, JLC, NLC, VLEPP, CLIC), each requiring its own way to tackle the problem. In this workshop, many up-to-date R and D results were presented by each institute. Judging from what were discussed, we may well say that the R and D work has advanced to such a level that the different approaches are rather helping each other to reach more concrete results. (J.P.N.).

12899 (LA–12714-MS) **Simulation of the GEM central tracker performance using GEANT.** Brooks, M.L. Los Alamos National Lab., NM (United States). Apr 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007834. Source: OSTI; NTIS; INIS; GPO Dep.

The GEM (Gamma Electron Muon) central tracker (one of the proposed detectors for the Superconducting Supercollider (SSC)) has been simulated using the high energy physics Monte Carlo code GEANT. The performance of the GEM central tracker in terms of momentum, impact parameter, and z vertex resolution has been determined. The resolutions will be presented for both the full tracker which includes a silicon portion and an IPC portion and for the 10^{34} configuration which is comprised of only IPC chambers. The resolution of electrons vs. muons will also be presented.

12900 (LAL-RT–91-14) **Theoretical investigation of a travelling-wave rf gun.** Gao, J. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Dec 1991. 29p. Order Number DE94618107. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods (NL).

A travelling-wave type rf gun (TW gun) is investigated theoretically. Analytical formulae concerning energy gain, energy spread, and transverse emittance are derived. After showing the corresponding formulae for the standing-wave rf gun (SW gun), comparisons are made between the two types of rf gun. Finally, some numerical results are calculated to demonstrate further the behaviours of the TW gun, and to compare with those from analytical formulae. (author) 11 refs.; 27 figs.

12901 (LAL-RT–93-06) **Matching of the coupler cavity to travelling wave structures at any operating mode.** Chanudet, M. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Jun 1993. 17p. Order Number DE94618111. Source: OSTI; NTIS (US Sales Only); INIS.

For the realization of an accelerating travelling wave structure, it is important to adjust the coupler so that the rf power arriving through a rectangular waveguide is coupled to the structure without reflection from the input aperture of the first cavity, the coupler cavity. The problem consists in carefully determining the dimensions of the coupling aperture. A method is proposed to measure this coupling in the case of monoperiodic forward and backward wave structures. The theory is based on the possibility of representing the properties of electromagnetic modes in periodic structures by coupled RLC circuits. The study of current I and voltage V versus frequency ω allows the simulation of H and E fields, respectively, for the different modes appearing in a travelling wave structure. (K.A.) 4 refs.; 14 figs.

12902 (LA-UR–93-4512) **Analysis of LAMPF air activation by high-energy particles with LAHET-MCNP.** Shire, P.R. (Westinghouse Hanford Co., Richland, WA (United States)); Waters, L.S.; Bland, J.R. Los Alamos National Lab., NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940424–7: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94005014. Source: OSTI; NTIS; INIS; GPO Dep.

Air activation calculations have been performed for the Los Alamos Meson Physics Facility air exhaust system and compared to on-line radioactivity measurements at the gas monitor for the seven most abundant radionuclides produced. Purge air drawn into the exhaust system is activated by high-energy particles, which succeed in penetrating shielding at the targets and at the beam stop. The activated air is transported by blowers to the stack release point. Because this accelerator-generated air activation is the major part of radioactive airborne releases at Los Alamos, its evaluation is an important part of the environmental program. Particle flux spectra vs energy at the targets and beam stop were calculated by the high-energy transport code LAHET and the Monte Carlo code MCNP. The flux spectra were then combined with activation cross section data and a model of the accelerator air exhaust system to calculate production of gaseous radionuclides with the ACTIV code. The predicted production of ^{41}Ar is in reasonable agreement with on-line measurements, considering the relatively minor abundance of its precursor, ^{40}Ar, in air. The agreement shows that the air activation models in this study are basically correct because this reaction is dependent on an accurate prediction of thermal neutron flux. The prediction of total gaseous activity release is also very good, being within 11% of that measured for the last 3 years; the prediction of three important individual radionuclides, ^{15}O, ^{11}C, and ^{13}N, was reasonable and within 50% accuracy.

12903 (LA-UR–94-152) **A second report on the experimental progress of the one microsecond, one kilojoule per pulse L-band relativistic klystron at Los Alamos.** Haynes, W.B.; Carlsten, B.E.; Faehl, R.J.; Fazio, M.V.; Kwan, T.J.T.; Stringfield, R.M. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–19: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94006275. Source: OSTI; NTIS; GPO Dep.

Work is continuing on a high-current relativistic klystron amplifier (RKA) with the goal of producing 1 kJ per pulse with a 1 μs pulsewidth and a peak power of 1 GW. The three cavity tube has already produced pulses with more than 150 J and over 450 MW peak power. The original output cavity was thought to be limiting the performance, and a new cavity has been designed, built, and is now on-line and being conditioned up towards high power. Current experimental results are presented.

12904 (NIIEFA-P-B–0884) **Numerical simulation of multicomponent beams in ion injection systems.** V'yuga, E.N.; Svistunov, Yu.A. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1991. 20p. (In Russian). Order Number DE94616168. Source: OSTI; NTIS (US Sales Only); INIS.

The work is devoted to problems of numerical simulation of multicomponent charged particle beams in beam shaping and injection systems with plasma sources. Algorithm of combined integration of Poisson and dynamics equations in the regions with complex boundary configuration is presented. The dynamics of a 'useful' beam with the presence of accompanying components in the injection systems of two types, namely - with electrostatic system of final acceleration and with particle focusing by pulse solenoidal field, is studied. Comparison of results with and without regard of accompanying components is given. 10 refs., 13 figs., 2 tabs.

12905 (NIIEFA-P-K–0887) **Spectroscopic study on preanode plasma in the high-voltage glow discharge based electron accelerator.** Abroyan, M.A.; Viknyanshchuk, N.A.; Kosogorov, L.S.; Lyublin, B.V. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1991. 9p. (In Russian). Order Number DE94616202. Source: OSTI; NTIS (US Sales Only); INIS.

Results of investigations into the parameters of preanode plasma of self-maintained discharge which serves as a auxilliary one for pulse wide-apperture electron accelerator based on high-voltage glow-discharge are described. The basic discharge parameters including 0.7 eV atom temperature, 8 x 10^{13} cm^{-3} ion density, 2 eV electron temperature and 10% plasma ionization degree, are determined using spectroscopic and probe methods of plasma investigations. The qualitative composition of discharge plasma is determined, timing characteristics of spectral line radiation and molecular bands emitted from plasma are studied. The presence of two groups of fast electrons is detected, assumptions concerning the energy and concentration of particles in each group are made. Problems linked with auxilliary discharge parameter effect on the accelerator operation stability are discussed. 7 refs., 2 figs., 1 tab.

12906 (SAND–93-0092C) **Design and evaluation of coils for a 50 mm diameter induction coilgun launcher.** Kaye, R.J. (Sandia National Labs., Albuquerque, NM (United States)); Shokair, I.R.; Wavrik, R.W.; Dempsey, J.F.; Honey, W.E.; Shimp, K.J.; Douglas, G.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940481–1: 7. symposium on electromagnetic launch technology, San Diego, CA (United States), 20-24 Apr 1994). Order Number DE94005244. Source: OSTI; NTIS; GPO Dep.

Coilguns have the ability to provide magnetic pressure to projectiles which results in near constant acceleration. However, to achieve this performance and control projectile hearing, significant constraints are placed on the design of the coils. We are developing coils to produce an effective projectile base pressure of 100 MPa (1kbar) as a step toward reaching base pressures of 200 MPa. The design uses a scalable technology applicable to the entire range of breech to muzzle coils of a multi-stage launcher. This paper presents the design of capacitor-driven coils for launching nominal 50 mm, 350 gram projectiles. Design criteria, constraints, mechanical stress analysis, launcher performance, and test results are discussed.

12907 (SLAC–431) **High accuracy electromagnetic field solvers for cylindrical waveguides and axisymmetric structures using the finite element method.** Nelson, E.M. Stanford

Linear Accelerator Center, Menlo Park, CA (United States). Dec 1993. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94007667. Source: OSTI; NTIS; INIS; GPO Dep.

Some two-dimensional finite element electromagnetic field solvers are described and tested. For TE and TM modes in homogeneous cylindrical waveguides and monopole modes in homogeneous axisymmetric structures, the solvers find approximate solutions to a weak formulation of the wave equation. Second-order isoparametric lagrangian triangular elements represent the field. For multipole modes in axisymmetric structures, the solver finds approximate solutions to a weak form of the curl-curl formulation of Maxwell's equations. Second-order triangular edge elements represent the radial (ρ) and axial (z) components of the field, while a second-order lagrangian basis represents the azimuthal (ϕ) component of the field weighted by the radius ρ. A reduced set of basis functions is employed for elements touching the axis. With this basis the spurious modes of the curl-curl formulation have zero frequency, so spurious modes are easily distinguished from non-static physical modes. Tests on an annular ring, a pillbox and a sphere indicate the solutions converge rapidly as the mesh is refined. Computed eigenvalues with relative errors of less than a few parts per million are obtained. Boundary conditions for symmetric, periodic and symmetric-periodic structures are discussed and included in the field solver. Boundary conditions for structures with inversion symmetry are also discussed. Special corner elements are described and employed to improve the accuracy of cylindrical waveguide and monopole modes with singular fields at sharp corners. The field solver is applied to three problems: (1) cross-field amplifier slow-wave circuits, (2) a detuned disk-loaded waveguide linear accelerator structure and (3) a 90° overmoded waveguide bend. The detuned accelerator structure is a critical application of this high accuracy field solver. To maintain low long-range wakefields, tight design and manufacturing tolerances are required.

12908 (UCRL-JC–116189) **Status of experiments at LLNL on high-power x-band microwave generators.** Houck, T.L.; Westenskow, G.A. Lawrence Livermore National Lab., CA (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940142–14: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007074. Source: OSTI; NTIS; INIS; GPO Dep.

The Microwave Source Facility at the Lawrence Livermore National Laboratory (LLNL) is studying the application of induction accelerator technology to high-power microwave generators suitable for linear collider power sources. We report on the results of two experiments, both using the Choppertron's 11.4 GHz modulator and a 5-MeV, 1-kA induction beam. The first experimental configuration has a single travelingwave output structure designed to Produce in excess of 300 MW in a single fundamental waveguide. This output structure consists of 12 individual cells, the first two incorporating de-Q-ing circuits to dampen higher order remnant modes. The second experiment studies the feasibility of enhancing beam to microwave power conversion by accelerating a modulated beam with induction cells. Referred to as the "Reacceleration Experiments this experiment consists of three traveling-wave output structures designed to produce about 125 MW per output and two induction cells located between the outputs. Status of current and planned experiments are presented.

4304 Storage Rings

Refer also to citation(s) 12832, 12858, 12872, 12877, 12878, 12881, 12889, 12896

12909 (BNL–52389, pp. 448-455) **Physics at DAΦNE.** Rizzini, E.L. (Universita di Brescia (Italy)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The basic design criteria of DAΦNE, the Frascati Φ-factory, are presented with the main physics items. The DAΦNE project of the INFN Frascati National Labs. consists in the construction of a two ring colliding beam Φ-factory and a 510 MeV e^+/e^- injector for topping-up. The initial luminosity goal is $L=10^{32}cm^{-2}\ sec^{-1}$ while the final luminosity target is $L \sim 10^{33}cm^{-2}\ sec^{-1}$.

12910 (BUDKERINP–91-119) **Radiation from the lenses of the focusing system of the linear collider and utilization of this radiation for alignment.** Mikhajlichenko, A.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 14p. Order Number DE94618116. Source: OSTI; NTIS (US Sales Only); INIS.

There is revised the phenomena of radiation of the particles in the focusing tract of the Linear collider. Analysis of the polarization is the additional factor in this procedure. 16 refs.

12911 (BUDKERINP–92-20) **Physics on internal targets at NEP ring.** Wojtsekhowski, B.B. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 33p. Order Number DE94618117. Source: OSTI; NTIS (US Sales Only); INIS.

Physics program are presented here for nuclear physics studies by 200 MeV electrons for the physics motivation of the NEP ring construction. NEP project and its status are discussed also. Perspective physics program is shown. Pion photoproduction at threshold and elastic electron scattering on the polarized potassium are described in some details. Double polarized experiments for electro- and photonuclear reactions are unique possibilities at NEP. 24 refs.; 15 figs.; 3 tabs.

12912 (DESY–93-014) **First measurements at HERA of deep inelastic scattering at low x.** Roeck, A. de (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Klein, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 20p. (CONF-9206322–: 4. topical seminar on the standard model and just beyond, San Miniato (Italy), 1-5 Jun 1992). Order Number DE94752386. Source: OSTI; NTIS (US Sales Only); INIS.

In 1992 HERA, the first electron-proton colliding accelerator, came into operation. This paper presents a brief account on HERA's history, components and performance. The methods of both HERA experiments, H1 and ZEUS, are explained which lead to the identification of about 100 deep inelastic events among a huge background caused mainly by proton beam interactions and photoproduction events. The published results of the two experiments are compared, based on the the first data obtained in summer 1992 with an integrated luminosity of about 2 nb^{-1}. The phenomenology and HERA perspectives of deep inelastic physics at low χ are discussed. (orig.)

12913 (INIS-RU–373) **B-factory project in Novosibirsk.** Aleksandrov, A.V. (and others); Anashin, V.V.; Belomestnykh, S.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 97p. (In Russian). Order Number DE94616233. Source: OSTI; NTIS (US Sales Only); INIS.

Project and the physical program of the asymmetric B factory are described. Main systems and synchrotron radiation detectors are described.

12914 (IYaF–91-25) **New electron beam collector for LEAR.** Bosser, J. (and others); Bykovskij, V.F.; Ley, R. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 17p. (In Russian). Order Number DE94616234. Source: OSTI; NTIS (US Sales Only); INIS.

A new collector of electron beam for the electron cooling system the LEAR storage with the current up to 3,3 A and energy up to 35 keV. The collector perveanse achieves 20 $\mu AV^{-3/2}$.

12915 (IYaF–91-44) **Compensation of a coherent shift of the betatron oscillation frequency of a bunch in a storage ring vacuum chamber.** Parkhomchuk, V.V.; Seryj, A.A.; Shil'tsev, V.D. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 16p. (In Russian). Order Number DE94618118. Source: OSTI; NTIS (US Sales Only); INIS.

Electromagnetic fields, appearing when transmitting a charged particle beam inside a nonideally conducting vacuum chamber of a storage ring, influence substantially on the particle dynamics. The

proposed compensation system permits substantially to increase the limiting currents in accelerators and storage rings.

12916 (IYaF–92-40) **Electron beam with controlled beam current for electron beam cooling system of the LEAR storage ring.** Zapunyako, A.M. (and others); Meshkov, I.N.; Polyakov, V.N. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 33p. (In Russian). Order Number DE94618119. Source: OSTI; NTIS (US Sales Only); INIS.

Three-elecrode electron gun for the electron cooling system of the LEAR antiproton storage is described.

12917 (IYaF–92-79) **Computer simulation of beam-beam effects at large amplitudes and determination of life time.** Shatilov, D.N. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 33p. (In Russian). Order Number DE94616235. Source: OSTI; NTIS (US Sales Only); INIS.

Computer simulation of beam-beam effects requires a very large processor time for determination of lifetime. A new method is proposed for smooth, step-by-step, construction of the particle distribution in the amplitude space. The method permits to decrease the simulation time by some orders of magnitude. One of the main advantages of the method is a possibility to check its accuracy. The physical substantiation, algorithm and applicability conditions of the method are presented. The first obtained results are given too. 6 refs.; 16 figs.

12918 (KEK–93-2) **A single-passage beam-position monitor system for the TRISTAN AR-to-MR transport lines.** Ieiri, T. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Arinaga, M. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Apr 1993. 31p. Order Number DE94748585. Source: OSTI; NTIS; INIS.

A beam-position monitor (BPM) system has been installed in the transport lines between the Accumulation Ring (AR) and the Main Ring (MR) of TRISTAN. This system comprises stripline and button electrodes, detectors and charge-sensitive ADCs. The detector is a homodyne type synchronous-receiver at 70 MHz with four channels corresponding to four electrodes. Operation software automatically displays the detected beam position and its charge on a TV screen after each passage of the beam. The system is stable and is used to monitor the drift of the beam position. (author).

12919 (KEK–93-5) **Development of a Nb_3Sn racetrack magnet for a 10T superconducting wiggler.** Fukushima, Y.; Ohmi, K.; Yamakawa, T.; Fujiwara, M. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Jun 1993. 12p. Order Number DE94748550. Source: OSTI; NTIS; INIS.

We are designing a superconducting wiggler with an extremely high field. The wiggler will be used as a synchrotron-radiation source after inserting a storage ring. The wiggler will produce hard X-rays by a high field. We have chosen a field strength of 10T for our purpose. In order to obtain such a high field, we propose the use of Nb_3Sn for the superconducting material. It is preferred to wind the material into a racetrack shape to be used as wiggler magnets, rather than using a cylindrical shape like that used in a solenoid. However, there is much difficulty to wind the material into a racetrack shape, and to minimize the stresses acting on the coil. We made a racetrack magnet for the R and D of Nb_3Sn technology. Here, we present the results due to the characteristics of the Nb_3Sn racetrack magnet. (author).

12920 (KEK-PROC–92-15, pp. 40-43) **HESYRL control system status.** Yao Chihyuan (China Univ. of Science and Technology, Hefei, AH (China). Hefei Synchrotron Radiation Lab.). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

HESYRL synchrotron radiation storage ring was completed in 1989 and has been in commissioning since then. Now it has met its design specification and is ready for synchrotron light experiments. Control system of the project was completed in 1989 and some modifications were made during commissioning. This paper describes its present configuration, status and upgrading plan. (author).

12921 (KEK-PROC–92-15, pp. 85-88) **The rejuvenation of TRISTAN control system.** Mimashi, T. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Urakawa, J.; Kurokawa, S.; Kawamoto, T.; Takeda, S.; Akiyama, A.; Kudoh, K.; Komada, K.; Naitoh, T. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Dec 1992. (CONF-911116–: ICALEPCS '91: International conference on accelerator and large experimental physics control systems, Tsukuba (Japan), 11-15 Nov 1991). In *Proceedings of international conference on accelerators and large experimental physics control systems.* 658p. Order Number DE94727632. Source: OSTI; NTIS; INIS.

The current TRISTAN accelerator control system uses CAMAC as a front end electronics, and they are controlled by twenty five Hitachi minicomputer HIDIC 80's which are linked with an N-to-N token ring network. After five years from now, these computers must be replaced. This is because of the life time of control system and we have to cope with the requirements imposed by our future project such as the KEK B-Factory and the main ring photon factory projects. The rejuvenation of this control has to be done under some constraints such as the lack of manpower, limited time and financing. First we review the problems of current control system, then the philosophy of the new generation control system is presented. Finally it is discussed how to move to the new generation control system from the current TRISTAN control system. (author).

44 INSTRUMENTATION

Refer also to citation(s) 12474

4401 Radiation Instrumentation

Refer also to citation(s) 12467, 12468, 12786, 12899, 13170, 13228, 13328, 13423, 13425, 13426, 13467, 13554, 13630, 13793, 13943

12922 (ANL-HEP-CP–94-08) **Neutron fluence calculations for the SDC detector and the results of codes comparison.** Job, P.K. (Argonne National Lab., IL (United States)); Handler, T.; Gabriel, T.A.; Slater, C.O.; Waters, L.S.; Palounek, A.P.T.; Zeitnitz, C. Argonne National Lab., IL (United States); Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States); Tennessee Univ., Knoxville, TN (United States). Apr 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC05-84OR21400 ; AS05-76ER03956. (CONF-940424–24: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94007650. Source: OSTI; NTIS; INIS; GPO Dep.

CALOR89, A Monte Carlo particle physics code package in conjunction with ISAJET, a high energy particle collision code, has been successfully used to evaluate the radiation environment of a high energy physics collider detector. We found that for a collider luminosity of 10^{33} $cm^{-2sec-1}$, the neutron fluences can be significant at certain detector locations.

12923 (ANL-HEP-TR–94-13) **Conceptual design for the STAR barrel electromagnetic calorimeter support rings.** Bielick, E.; Fornek, T.; Spinka, H.; Underwood, D. Argonne National Lab., IL (United States). 15 Feb 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008426. Source: OSTI; NTIS; INIS; GPO Dep.

The STAR electromagnetic calorimeter (EMC) will be used to measure the energy of photons and electrons from collisions of beams of particles in the RHIC accelerator under construction at Brookhaven National Laboratory. The present design is documented in the EMC Conceptual Design Report, and consists of a cylindrical barrel and two flat endcap calorimeter sections. The barrel EMC will consist of 120 modules, each subtending 6° in azimuthal angle about the beam (ϕ), and half the barrel length. Each module will be subdivided into "towers" of alternating scintillator and lead, which project to the nominal interaction point. There is a

strong coupling between the designs for the EMC and for the conventional solenoidal magnet, which will be located immediately outside the barrel EMC. For example, the inner radius of the magnet must be minimized to lower costs and to reduce the STAR detector's outer diameter to fit within constraints of the existing detector building. This condition requires the calorimeter modules to be just thick enough to accomplish physics goals and to support their weight with small deflections. This note describes progress in the design of the EMC support rings. Several ring designs and methods of construction have been considered. In addition, installation and alignment problems for both the rings and the rails have been considered in more depth. Finally, revised stress calculations for the recommended ring designs have been performed. Most of this work has been done in close collaboration with the STAR magnet subgroup.

12924 (BfS-ST-4/93) **Radon measurements in buildings using charcoal detectors and liquid scintillation spectrometry. - Method for rapid determination of radon-222 in building air - screening measurement.** Beyermann, M. (Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz); Hoefs, B.; Gans, I.; Loennig, M. Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. Jul 1993. 49p. (In German). Order Number DE94752450. Source: OSTI; NTIS (US Sales Only); INIS.

Between November 1990 and April 1993, screening measurements of indoor radon concentrations were carried out at 250 locations in the new Federal States ("Laender") of Germany. The method applied for the determination of radon concentrations in air by means of charcoal detectors and liquid scintillation measurement is described, its advantages as well as limitations are discussed, but no assessment of the measurement results has been given. Furthermore, a method for rapid determination of indoor radon-222 concentration-screening measurement is presented. (orig.)

12925 (BNL–49816) **Analytical solutions of minimum ionization particle induced current shapes of silicon detectors and simulation of charge collection properties.** Eremin, V. (A.F. Ioffe Physico-Technical Inst., of Academy of Sciences of Russia, St. Petersburg, (Russian Federation)); Chen, W.; Li, Z. Brookhaven National Lab., Upton, NY (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-931107–35: 1993 IEEE nuclear science symposium and medical imaging conference, San Francisco, CA (United States), 2-5 Nov 1993). Order Number DE94007523. Source: OSTI; NTIS; INIS; GPO Dep.

A new analytical, one dimensional method to obtain the induced current shapes and simulation of chasrge shapes for $p^+ -n-n^+$ silicon detectors in the case of minimum ionization particle has been developed here. jExact solutions have been found for both electron and hole current shapes. Simulations of induced charge shapes of detectors have also been given. The results of this work are consistent with the earlier work where a semi-analytical method had been used.

12926 (BNL–52389, pp. 563-568) **Prototype detector for η physics.** Tippens, W.B. (UCLA, Los Angeles, CA (United States)); Clajus, M.; Kessler, R.; Nefkens, B.; Wang, M.J.; White, D. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors report on a novel design for a compact magnetic spectrometer to study η physics. The design uses two 40 cm diameter superconducting solenoids separated by a gap of 45 cm which allows approximately 3π acceptance for two body processes. Properties of the field and design criteria for the major components of the detector are discussed.

12927 (BNL–52389, pp. 569-574) **A 4π photon detector for neutral η decays and baryon spectroscopy.** Clajus, M. (Univ. of California, Los Angeles, CA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Decays of the η mesons into π^0's and photons are interesting for performing new tests of CP and other symmetries. To study these decays, which involves the detection of two to six photons, the authors propose a large solid angle detector setup of the crystal barrel type. Such a device would also be useful for the spectroscopy of baryon resonances (N, Λ, Σ) that decay by the emission of an η.

12928 (BNL–70395) **Travel to Switzerland to attend the Compact Muon Solenoid Collaboration week: Foreign trip report, February 7, 1994–February 14, 1994.** Polychronakos, V.A. Brookhaven National Lab., Upton, NY (United States). 3 Mar 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94008663. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A large group of physicists and engineers from Brookhaven National Laboratory were participating in the GEM (Gammas, Electrons, Muons) Experiment at the Superconducting Supercollider Laboratory (SSC). One of the two main activities of the group was the development of the Cathode Strip Chambers (CSC) for the Endcap Muon System. The development of this technology was done in collaboration with groups from Boston University, the State University of New York at Stony Brook and the St. Petersburg Nuclear Physics Institute, Russia, and other GEM groups. It offers high spatial resolution, bunch crossing identification and trigger functions all with one technology. Interest has been expressed by both the ATLAS and the CMS experiments at the LHC to collaborate in a possible use of the CSC technology in these experiments. I attended the CMS collaboration meeting and held discussions with members of the ATLAS muon group which resulted in submitting a proposal to cover the high pseudorapidity region of the ATLAS muon system with these chambers.

12929 (BONN-IR-93-73) **Implementation of the FASTBUS data-acquisition system in the readout of the SAPHIR detector.** Empt, J. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Dec 1993. 47p. Order Number DE94747250. Source: OSTI; NTIS (US Sales Only); INIS.

The magnetic detector SAPHIR is layed out to detect multiparticle final states with good acuracy, especially a good photon detection capability is designed. Therefore a large electromagnetic calorimeter was built, consisting of 98 modules covering a detection area of about 16 m^2 in forward direction. For this calorimeter a brass-gas-sandwich detector was developed with signal wires perpendicular to the converter planes. For data acquisition of a major part of this calorimeter a modular FASTBUS system is used. In this report the FASTBUS system and its installation in the SAPHIR Online Program are described. (orig.)

12930 (CEA-CONF–11689) **Numerical modeling of working of a multicellular proportional counter aimed to individual dosimetry of neutrons.** Bordy, J.M. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire); Barthe, J.; Boutruche, B.; Segur, P. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. 1993. 5p. (In French). (CONF-9302166–: Conference on dosimetry in Defense studies, Arcueil (France), 3 Feb 1993). Order Number DE94618189. Source: OSTI; NTIS (US Sales Only); INIS.

The use of a personal dosimeter imposes severe constraints, particularly for tension of polarization and tolerable dimensions. That why a numerical modeling of this detector working is an appreciable help for conception. It allows to determine quickly the influence of modification of different parameters (nature and pressure of gas, dimension of electrodes, dimension of channels, tension of polarization,...) without having to make new prototypes. The aim of this report is to give some numerical results got with a multicellular counter with a cylindrical geometry. 6 figs.

12931 (DESY–93-020) **The H1 forward muon spectrometer.** Kenyon, I.R. (Birmingham Univ. (United Kingdom). School of

Physics and Space Research); Phillips, H.; Cronstroem, H.I.; Hedberg, V.; Jacobsson, C.; Joensson, L.; Lohmander, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 11p. Order Number DE94752383. Source: OSTI; NTIS (US Sales Only); INIS.

The H1 detector started taking data at the electron- proton collider HERA in the beginning of 1992. In HERA 30 GeV electrons collide with 820 GeV protons giving a strong boost of the centre-of-mass system in the direction of the proton, also called the forward region. For the detection of high momentum muons in this region a muon spectrometer has been constructed, consisting of six drift chamber planes, three either side of a toroidal magnet. A first brief description of the system and its main parameters as well as the principles for track reconstruction and T_0 determination is given. (orig.)

12932 (DESY–93-026) **An experiment to study CP violation in the B system using an internal target at the HERA proton ring.** Hofmann, W. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Mar 1993. 41p. (CONF-9301132–: 1. international workshop on B-physics at hadron machines (UNK B-workshop), Melnik (Czech Republic), 18-22 Jan 1993). Order Number DE94752387. Source: OSTI; NTIS (US Sales Only); INIS.

A group of physicists centered around the ARGUS collaboration got interested in hadron accelerators as a prolific source of B hadrons. The group is presently studying the option of a major-B-physics experiment to be performed at the HERA proton storage ring in fixed target mode using an internal target. Basic goal of the experiment is the detection of CP violation in the 'gold plated' $B^0 \rightarrow J/\Psi\ K_s$ decay mode, using a dedicated detector triggered on lepton pairs from J/Ψ decay. (orig./HSI)

12933 (DESY–93-091) **ZEUS contributions to the Real-Time 93 conference, Vancouver, Canada.** ZEUS Data Acquisition Group. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 45p. (CONF-930640–: 8. IEEE conference on real-time computer applications in nuclear, particle and plasma physics, Vancouver (Canada), 8-11 Jun 1993). Order Number DE94752400. Source: OSTI; NTIS (US Sales Only); INIS.

This is a collection of the eight contributions of the ZEUS Data Acquisition group, presented at the Eighth Conference on Real-Time Computer Applications in Nuclear, Particle and Plasma Physics, Vancouver, Canada, June 8-11, 1993. This note describes the major parts of the ZEUS Data Acquisition system and the experience gained since the first HERA running in April 1992. Note that the papers are appended in the order of recommended reading, which does not reflect the order of importance. The presenters for the papers are listed in the following. (orig.)

12934 (DESY–93-143) **Electromagnetic calorimetry with lead fluoride crystals.** Appuhn, R.D. (Dortmund Univ. (Germany). Inst. fuer Physik); Deckers, T.; Kolanoski, H.; Lindner, A.; Spielmann, S.; Walther, A.; Wegener, D.; Brasse, F. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1993. 17p. Order Number DE94751733. Source: OSTI; NTIS (US Sales Only); INIS.

The properties of four PbF_2 crystals of size 21.21.175 mm^3 were studied with electron and pion beams in the energy range from 1 to 6 GeV. An energy resolution for electrons of $6.3\%/\sqrt{(E/GeV)}$ was achieved with a 2x2 matrix of four PbF_2 crystals, which corresponds to $5.6\%/\sqrt{(E/GeV)}$ when corrected for lateral leakage by Monte Carlo simulations. The deviation from linearity was smaller than 0.5%. The time resolution was found to be better than 0.6 ns. We studied also optical properties, radiation hardness, position resolution and spatial homogeneity. An efficient separation of electromagnetic and hadronic showers was achieved. (orig.)

12935 (DOE/ER/60522–7) **Development and application of photosensitive device systems to studies of biological and organic materials: Progress report, January 1, 1993–December 31, 1993.** Gruner, S.M.; Reynolds, G.T. Princeton Univ., NJ (United States). Joseph Henry Labs. 14 Sep 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER60522. Order Number DE94008503. Source: OSTI; NTIS; GPO Dep.

This progress report summarizes results, as of August, 1993, for DOE grant DE-FG-02-76ER60522 during the fiscal period 1/1/93 to 12/31/93, which is the first year of a 3-year grant cycle. The overall goals of the grant are to develop advanced x-ray detector technologies, especially as applicable for biological and materials research at the national laboratories, and to train graduate and post-doctoral students on the use of these technologies via the performance of original biological and materials research. As summarized below, there has been good progress toward achieving the research goals of the original 3-year proposal; in consequence, the research plan and the total budget for the rest of 1993 and beyond is still well described by the original proposal. Accomplishments since the last progress report include: (A) A 1k x 1k fiber optically coupled CCD detector was assembled, tested at CHESS and is slated for extended user trials this Fall. A 2k x 2k CCD detector is being assembled for permanent installation at CHESS. (B) X-ray detector phosphors, calibration techniques, and system software have been developed. (C) The design of a Pixel Array Detector, a collaborative project with the Advanced Photon Source, has been initiated. (D) The properties of biomembrane lipids under extremes of pressure have been investigated. High pressure instrumentation and techniques have been developed. (E) The physics of mesophase formation in biomembrane lipid, surfactant, and polymeric systems have been studied. This includes study of the interaction of membrane proteins with elastically strained lipid bilayers. (G) Work has been initiated on the use of thermal diffuse scatter from proteins as a probe of protein dynamics. (H) Studies on luminescent phenomena have been reported. Since the last progress report (dated 15 May 1992), this work has resulted in 10 published papers, 7 abstracts, 1 Ph.D. thesis and 1 technical report.

12936 (DOE/FTR–94003591) **Trip to Europe to participate in international conferences on detectors of particles and photons: Foreign trip report, September 1, 1993–September 26, 1993.** Vladimir, P. Fermi National Accelerator Lab., Batavia, IL (United States). 28 Oct 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94003591. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Review of latest achievement on detector development is presented. Short summary of the most interesting topics is given. New perspective directions in developments are identified and analyzed. Accompanying problems are discussed. Recommendation for the USA research activity in these directions are given.

12937 (FNAL/C–94/018) **Trigger and electronics issues for scintillating fiber tracking.** Baumbaugh, A.E. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310261–4: SCIFI 93: workshop on scintillating fiber detectors, South Bend, IN (United States), 24-28 Oct 1993). Order Number DE94007391. Source: OSTI; NTIS; INIS; GPO Dep.

Scintillating Fiber technology has made great advances and has demonstrated great promise for high speed charged particle tracking and triggering. The small detector sizes and fast scintillation floors available, make them very promising for use at high luminosity experiments at today's and tomorrow's colliding and fixed target experiments where high rate capability is essential. This paper will discuss some of the system aspects which should be considered by anyone attempting to design a scintillating fiber tracking system and high speed tracking trigger. As the reader will see, seemingly simple decisions can have far reaching effects on overall system performance.

12938 (FNAL/C–94/023-E) **The D0 upgrade.** Gruenendahl, S. (Rochester Univ., NY (United States). Dept. of Physics and Astronomy). The D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–16: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94006953. Source: OSTI; NTIS; INIS; GPO Dep.

In order to maximize the physics potential of the Fermilab Tevatron proton antiproton collider complex, both the accelerator system and the two large collider detectors are undergoing major upgrades

during the remainder of this decade. For the D0 detector, the upgrade focuses on implementation of an integrated magnetic tracker in the central region of the detector, accompanied by those modifications to other parts of the apparatus necessary to cope with the increase in interaction rate provided by the collider.

12939 (FNAL/C–94/030-E) **CDF End Plug calorimeter Upgrade Project.** Apollinari, G. (Rockefeller Univ., New York, NY (United States)); de Barbaro, P.; Mishina, M. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9309166–3: 4. international conference on calorimetry in high-energy physics, Elba (Italy), 19-25 Sep 1993). Order Number DE94007401. Source: OSTI; NTIS; INIS; GPO Dep.

We report on the status of the CDF End Plug Upgrade Project. In this project, the CDF calorimeters in the end plug and the forward regions will be replaced by a single scintillator based calorimeter. After an extensive R&D effort on the tile/fiber calorimetry, we have now advanced to a construction phase. We review the results of the R&D leading to the final design of the calorimeters and the development of tooling devised for this project. The quality control program of the production of the electromagnetic and hadronic calorimeters is described. A shower maximum detector for the measurement of the shower centroid and the shower profile of electrons, γ and π^0 has been designed. Its performance requirements, R&D results and mechanical design are discussed.

12940 (FNAL-TM–1868) **Design of new polymers to improve radiation stability of plastic scintillators.** Barashkov, N. (Karpov Inst. of Physical Chemistry (Russian Federation)); Korotkikh, N.; Novikova, T.; Markley, F.; Pla-Dalmau, A.; Foster, G.; Rivard, M. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94008220. Source: OSTI; NTIS; INIS; GPO Dep.

Diffusion enhancers have been used to increase the radiation stability of scintillators. There is a danger that such additions will also allow the scintillation dyes to diffuse out of the matrix. Covalent bonding of the dyes into the matrix would eliminate any luminophore migration. We have demonstrated that dyes with vinyl and divinyl groups can be successfully bonded into a styrene matrix. Both primary and secondary luminophores have been bonded into the matrix and in several cases they have been compared with similar luminophores without the vinyl groups in otherwise identical compositions. In general the bonding does not greatly affect either the radiation stability of the composition or its light output, but is therefore proven to be an acceptable method of preventing luminophore migration. Scintillators with a base of aromatic or alicyclic epoxy resins have also been made with bonded luminophores. In these compositions the bonding is accomplished by using luminophores with one or two amine groups or epoxy groups. When using the amines, they are first prereacted with the epoxy resin and the modified epoxy is then cured with hexahydrophthalic anhydride or trimethoxyboroxine. The emission and absorption spectra of many of these reactive luminophores are given, along with the light outputs and radiation stability of the resulting scintilators.

12941 (FNAL-TM–1875) **Summary of the radiation damage studies of the SDC dopants in polystyrene.** Pla-Dalmau, A.; Foster, G.W.; Zhang, G. Fermi National Accelerator Lab., Batavia, IL (United States). 22 Dec 1993. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94007390. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 80 commercially available fluorescent organic compounds were studied as dopants in a polystyrene matrix for possible use in wavelength shifting (WLS) fibers. The goal was to find a new green- emitting WLS fiber which would outperform in light yield and decay time the currently available fiber doped with K-27. Therefore the fluorescent compounds of interest should exhibit the following spectroscopic characteristics in polystyrene: λ_{abs} = 400–450 nm,λ_{em} = 450–550 nm, τ = 3–7 ns and quantum efficiency of minimum 0.7. Polystyrene samples doped with different fluorescent compounds were prepared and characterized. Of all the compounds tested, only a series of coumarins exhibited the spectroscopic characteristics of interest. Radiation damage studies had to be performed on these samples in order to condusively determine if they were better candidates than K-27 for green WLS fibers. AU samples except those showing opacity or deep coloration were irradiated. They were, however, separated in two sets. Radiation damage set No. 20 was mainly formed by the coumarin derivatives. Radiation damage set No. 22 was based on the remaining samples. The irradiations were performed at the Phoenix Memorial Laboratory using a ^{60}Co source. Both sets were exposed to a total dose of 10 Mrad in air, at a dose rate of 1.8 Mrad/h. Transmittance measurements were recorded before and after irradiation, and after annealing. After irradiation, the samples were annealed in oxygen to accelerate the recovery process.

12942 (GANIL-P–93-11) **The INDRA 4π detector and its scientific program.** Saint-Laurent, F. INDRA Collaboration. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 15p. (CONF-9305203–: International school seminar on heavy ion physics, Dubna (Russian Federation), 10-15 May 1993). Order Number DE94618209. Source: OSTI; NTIS (US Sales Only); INIS.

The INDRA 4π multidetector for light charged particles and heavy fragments is mainly dedicated to the study of the deexcitation of hot nuclear systems formed in nucleus-nucleus collisions in the intermediate energy domain under peculiar conditions of temperature or compression, and especially to the study of the multifragmentation. After a brief description of the detector and its capabilities to identify particles and fragments, the scientific program for the next three years is presented. (author) 15 refs.; 9 figs.; 1 tab.

12943 (GANIL-R–93-07) **INDRA. Electronic Architecture: Electronic architecture.** Ganil Team. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 10p. Order Number DE94618220. Source: OSTI; NTIS (US Sales Only); INIS.

The INDRA multidetector electronics is described. The system is a set of 17 rings consisting of 96 ionization chambers and 180 silicon detectors plus 324 cesium iodide and 12 Phoswich scintillators. Their integrated electronic lines, the trigger modules, the control and data acquisition units are presented briefly. (R.P.) 6 figs.

12944 (INIS-BR–3252) **Position sensitive x-ray detector.** Macchione, E.L.A. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 168p. (In Portuguese). Order Number DE94618221. Source: OSTI; NTIS (US Sales Only); INIS.

A multi ware position sensitive gas counter for X-ray detection was developed in our laboratory, making use of commercial delay-lines for position sensing. Six delay-line chips (50 ns delay each, 40 Mhz cut-off frequency) cover a total sensitive length of 150 mm leading to a delay-risetime ratio that allows for a high-resolution position detection. Tests using the 5,9 keV X-ray line from a ^{55} Fe source and integral linearity better than 0,1% and a maximal differential linearity of $\pm$4,0% were obtained operating the detector with an Ar-C H_4 (90%-10%) gas mixture at 700 torr. Similar tests were performed, using the 8,04 keV line from a Cu x-ray tube. A total resolution of 330 μm, and the same integral and differential linearities were obtained. (author).

12945 (INIS-BR–3253) **Gamma-gamma angular correlation measurement in the ^{100} Ru.** Kenchian, G. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 91p. (In Portuguese). Order Number DE94618201. Source: OSTI; NTIS (US Sales Only); INIS.

An angular correlation automatic spectrometer with two Ge(Li) detectors has been developed. The spectrometer moves automatically, controlled by a microcomputer. The gamma-gamma directional angular correlations of coincidence transitions have been measured in ^{100} Ru nuclide, following the β^+ and electron capture of ^{100} Rh. The ^{100} Rh source has been produced with ^{100} Ru(p,n)^{100} Rh reaction, using the proton beam of the Cyclotron Accelerator insiding in ^{100} Ru isotope. (author).

12946 (INIS-mf–13749, pp. 22) **Optimization of copper vapor laser.** Sadighi, R. (Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center); Golpaigani, A.; Soltanmoradi, F.; Zare, A.; Zand, A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic

Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METAL VAPOR LASERS/optimization; DESIGN; KHZ RANGE 01-100; OPTIMIZATION; POWER RANGE 10-100 W

12947 (INIS-mf–13749, pp. 113) **Holographic transmission phase grating.** Partovi-Shabestari, N. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of). Laser Research Center); Majidi-Zolbanin, H.; Hodjatzadeh, A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIFFRACTION GRATINGS/efficiency; EFFICIENCY; HOLOGRAPHY

12948 (INIS-mf–13791) **Laboratory for Semiconductor Detectors of Nuclear Radiation.** Lefterov, D.; Moravska, E.; Kozhukharov, I.; Mikhajlov, M. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 8p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94616485. Source: OSTI; NTIS (US Sales Only); INIS.

The Laboratory has been founded in 1967 in IRNE-BAS. Its basic task is research in the field of solid state radiation detectors and the provision of new detectors for some specific experiments conducted in the Institute. The research is focused on the development and refinement of Si-and Ge- detector technology. The diffusion technology for p-n junction creation has been upgraded. An intensive work is being performed in the following areas: (1) contacts creation on high-purity Ge and high-resistivity Si by means of regrowth and ion implantation technologies; (2) the X-ray detectors passivation using electron sputtered quartz; (3) surface barrier detectors production using Bulgarian unsaturated polyester resin; (4) the detector signal analog processing. A device for ballistic deficit correction has been developed. Low noise charge sensitive preamplifiers for α-, β-, γ- and X-ray detectors construction is a common practice. Using advanced technologies the Laboratory creates both standard and custom designed detectors. A thin window Ge(Li) well detector has been produced. A surface barrier detector developed in the Laboratory has been used for space measurements on the board of 'Bulgaria-1300' satellite. The Laboratory also maintains and repairs practically all types of commercial detectors and preamplifiers used in different fields of the industry - Kozloduy NPP, metallurgical engineering, environmental pollution prevention, radiation monitoring. (author).

12949 (INIS-RU–364, pp. 22) **Acoustic localization of active regions of a palladium target in a neutron-acoustic correlation experiment.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON EMISSION/acoustic monitoring; CORRELATIONS; DEUTERIUM; ELECTROLYSIS; NEUTRON DETECTION; PALLADIUM

12950 (IPNO-DRE–93-04) **The INDRA 4π detector and its physics program.** Borderie, B. INDRA Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Feb 1993. 14p. (CONF-9301126–: International winter meeting on nuclear physics, Bormio (Italy), 31 Jan 1993). Order Number DE94618222. Source: OSTI; NTIS (US Sales Only); INIS.

INDRA has been constructed by four laboratories (GANIL-Caen, IPN-Orsay, DAPNIA-Saclay and LPC-Caen) with the technical collaboration of the LAL-Orsay. This 4π charged product detector is mainly dedicated to the study of the de-excitation of nuclear systems formed in nucleus-nucleus collisions under peculiar conditions of temperature, compression and Z/A ratios. After a concise description of the detector, the planned research program for the next three years is presented. (author) 16 refs.; 8 figs.; 1 tab.

12951 (IPNO-DRE–93-11) **Gas filled detectors.** Stephan, C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 48p. Order Number DE94618210. Source: OSTI; NTIS (US Sales Only); INIS.

To be published in Handbook of Nuclear Decay Modes (US).

The main types of gas filled nuclear detectors: ionization chambers, proportional counters, parallel-plate avalanche counters (PPAC) and microstrip detectors are described. New devices are shown. A description of the processes involved in such detectors is also given. (K.A.) 123 refs.; 25 figs.; 3 tabs.

12952 (ISRP-K-TD–2) **Solid state nuclear track detection : theory and applications.** Bhagwat, A.M. (Bhabha Atomic Research Centre, Bombay (India)). Indian Society for Radiation Physics, Kalpakkam (India). Kalpakkam Chapter. 1993. 32p. Order Number DE94616486. Source: OSTI; NTIS (US Sales Only); INIS.

Solid state nuclear track detection (SSNTD) technique is simple and inexpensive in nature. The two main steps involved in SSNTD are the formation of latent tracks and their subsequent development (visualisation) by chemical or other means. These are discussed in detail. Applications of SSNTD in the fields of nuclear physics, dosimetry, biology and for determination of contents of an element and its spatial distribution are described. The monograph is intended to serve both beginners and specialists. It also gives a list of simple experiments that can be conveniently introduced at the undergraduate/postgraduate level. (M.G.B.). 20 refs., 8 figs., 3 tabs.

12953 (IYaF–91-96) **Electronics for the SND scintillation counter system.** Bajbusinov, B.O.; Druzhinin, D.P.; Usov, Yu.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 15p. (In Russian). Order Number DE94616453. Source: OSTI; NTIS (US Sales Only); INIS.

Electronic system is described for measuring the transmission time of particles through scintillation counters of the SND detector. The measurement channel contains decoupler-discriminator, time-to-digital converter, charge-to-digital converter and two delay lines. The measured time range is 60 ns, the measurement accuracy is 200 ps.

12954 (IYaF–92-28) **Electronics for KMD-2 calorimeters.** Aul'chenko, V.M. (and others); Bajbusinov, B.O.; Bondar', A.E. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 25p. (In Russian). Order Number DE94616454. Source: OSTI; NTIS (US Sales Only); INIS.

Electronic detection system is described for a cylindrical calorimeter on the base of CsI counters. Trigger units for the calorimeter is considered in detail.

12955 (JINR–2-93-59, pp. 56-64) **The method of the time-of-flight trigger with digital selection of events.** Ladygin, V.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Man'yakov, P.K.; Piskunov, N.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The method of timing measurements and the realization fo the time-of-flight trigger with digital selection using the magnetic spectrometer ALPHA are reported. The decision time of the time-of-flight trigger is 8μs. High-rejection power of the trigger without losses confirms the efficiency of the suggested method. A further development of the digital selection system is discussed. 30 refs.; 7 figs.

12956 (JINR–3-93-60, pp. 68-73) **Development of data acquisition system for Sphere spectrometer.** Anisimov, Y.S. (and others); Kuznetsov, V.A.; Malakhov, A.I. Joint Inst. for Nuclear

Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The 4π-detector SPHERE for studying of multiple particle cumulative production is currently under construction at the Laboratory of High Energies, JINR, Dubna. This paper briefly describes the present status and future developments of the data acquisition system for this setup. A multiprocessor system based on VMEbus will be implemented for parallel read out, even-building, data reprocessing. A workstation will be used for data analysis and experimental control. 6 refs., 2 figs.

12957 (JINR–3-93-60, pp. 74-76) **Extension of photomultiplier quantum sensitivity by waveshifting covering.** Gavrishchuk, O.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The method of extension of a photomultiplier spectral sensitivity by means of application of waveshifting coverings is developed. Some practical results on the Russian produced photomultipliere are given. 3 figs.

12958 (JINR–6-92-57, pp. 80-92) **Position-sensitive neutron detector as a module of neutron multidetector system.** Alkhazov, I.D. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Daniel, A.V.; Dmitriev, V.D.; Kozulin, E.M.; Kuznetsov, A.V.; Penionzhevich, Yu.E.; Rubcheniya, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The position-sensitive scintillation detector has been made. The detector consists of two photomultipliers and quartz tube filled with liquid scuntillator (d 6x100 cm) with n-γ-separation properties. The properties of the detercotr have been measured and calculated by SITHA code. The position resolution is 10 cm and time resolution is 1.4 ns. The neutron efficiency varies between 31% and 26% for neutron energy between 2 and 7 MeV, for neutron energy threshold - 1 MeV, respectively. 11 refs.; 10 figs.

12959 (JINR-E–13-93-234) **Wide aperture scintillation hodoscope with FEU-143 photomultipliers.** Afanas'ev, L.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Ivanov, M.A.; Karpukhin, V.V.; Komarov, V.I.; Kulikov, A.V.; Yazkov, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 14p. Order Number DE94618211. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Prib. Tekh. Ehksp.

Scintillation hodoscopes with FEU-143 photomultipliers are described. Every of two hodoscopes consists of 8 elements each of length 1400 mm and cross section 56x56 mm. The time and amplitude characteristics were obtained in real conditions of the physical experiment at the Protvino U-70 accelerator. A resolution on time difference between hits of two hodoscopes is 224 ps. A separation of pions and protons by their ionization losses is also provided at momenta less than 1000 MeV/c. 5 refs.; 8 figs.; 1 tab.

12960 (JINR-R–1-93-195) **Analytical calculation of the fluctuation compensation of longitudinal energy leaks of calorimeters.** Gavrishchuk, O.P. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Eremeev, R.V.; Kadykov, M.G.; Shalygin, A.B.; Yukaev, A.N.; Semenov, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. 6p. (In Russian). Order Number DE94616455. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Prib. Tech. Exp.

Analytic calculations of the compensation of longitudinal energy leakage fluctuations in short absorption calorimeters by optimizing shifter characteristics are described. The energy resolution of short absorption calorimeters over an energy range of 10-100 GeV was found to be equal to that of total absorption calorimeters by optimizing shifter characteristics. 4 refs.; 5 figs.; 1 tab.

12961 (JINR-R–6-93-139) **Investigations of characteristics of β-spectrograph with position sensitive detector.** Abdurazakov, A.A. (Tashkentskij Gosudarstvennyj Univ., Tashkent (Uzbekistan)); Butabaev, Yu.S.; Niyazov, R.A.; Kholmatov, A.Kh.; Gromov, K.Ya.; Lebedev, N.A.; Chumin, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 6p. (In Russian). Order Number DE94616426. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Organizing Committee of the 43-rd Intern. Conference on Nuclear Spectroscopy and Atomic Nucleus Structure, Dubna, April 1993.

The multichannel β-spectrograph with position-sensitive detector using the microchannel plates is created in Laboratory of Nuclear Problems-co-working with Tashkent State University. The resolving power of the spectrometer for electrons with energy 150 keV is 0.11%. The effective transmission of the β-spectrograph taking into account the multichannel registration of the spectrum is 1.3%. The investigations of the β-spectrograph are continued. It is planned to use the β-spectrograph in on-line experiments on the beam of radioactive ions of the YASNAPP facility. 2 refs.; 2 figs.

12962 (KFK–5181) **An in-beam Compton-suppressed Ge spectrometer for nondestructive neutron activation analysis.** Zaghloul, R. (Atomic Energy Establishment, Cairo (Egypt). Hot Lab.); Abd El-Haleam, A.; Mostafa, M.; Gantner, E.; Ache, H.J. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Radiochemie. Apr 1993. 45p. Order Number DE94752457. Source: OSTI; NTIS (US Sales Only); INIS.

A high-efficiency Compton background suppressed gamma-ray spectrometer by anti-coincidence counting with a NaI(Tl)-shield around a central HPGe-detector for in-beam prompt gamma-ray neutron activation analysis (AC-PGNAA) using a Cf-252 neutron source has been designed and built. The spectrometer consists of a high-purity germanium detector as the main detector and a large volume cylindrical NaI(Tl) detector as a guard detector. The irradiation facility contains two steel-lead collimators: One for neutron beam guide with polyethylene plug for neutron thermalization; the second collimator is for gamma-emission detection. The associated electronics working in conventional fast-slow mode have been designed to operate independently and simultaneously in the anti-coincidence mode as well as in the coincidence or in the normal passive mode. When operating in the anti-coincidence mode the Compton edge of Cs-137 is reduced by a factor of 7.9 to provide a peak-to-Compton edge ratio of 500/1. The assembly has the ability to measure instantaneously, simultaneously, and nondestructively bulk samples up to about 50 cm^3. Major constituent elements in several rocks and minerals can be determined, while oxygen cannot be measured due to its small capture cross section (0.27 mb). Several important minor and trace elements could be detected. The sensitivity of the AC-PGNAA technique is limited by the available neutron flux at the target matrix and the neutron absorption cross section of the elements of interest.

12963 (KFK–5190) **Solid state nuclear track detectors and their application in industrial health, radiological and environmental protection.** Urban, M. Kernforschungszentrum Karlsruhe GmbH (Germany). Hauptabteilung Sicherheit; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Elektrotechnik. Sep 1993. 246p. (In German). Order Number DE94747337. Source: OSTI; NTIS (US Sales Only); INIS.

Passive Solid State Nuclear Track Detectors are electrically non conductive solids, mainly used for the registration of α-particles and neutron induced recoils. The stability of the particle tracks in the solid allow longer integration periods, what is essential for the measurement of small, time variant radiation exposures. This report gives an overview on non-photographic track detectors, their processing, dosimetric properties and examples for their application in industrial health, radiological and environmental protection. (orig.)

12964 (LA–12713-MS) **Pattern recognition and tracker resolutions for the GEM central tracker at luminosity of 10^{34} $cm^{-2}s^{-1}$.** Brooks, M.L. Los Alamos National Lab., NM (United States). Apr 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007835. Source: OSTI; NTIS; INIS; GPO Dep.

A GEANT based pattern recognition algorithm has been used to study the track finding capabilities of the GEM central tracker at high luminosity (10^{34} $cm^{-2}s^{-1}$). The efficiency for finding tracks has been studied as a function of the number of silicon layers present in the tracker, as a function of the resolution of the pad chambers, as a function of the efficiency of the pad chambers, and as a function of eta and p_T for each of the above studies. The number of "fake" tracks that are found with the pattern recognition has also been calculated for each pattern recognition study.

12965 (LA–12737-M) **NBC operation manual including the multi-position add-a-source function.** Menlove, H.O.; Foster, L.A.; Baca, J. Los Alamos National Lab., NM (United States). Mar 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008164. Source: OSTI; NTIS; GPO Dep.

This manual describes the design modifications and operating characteristics of a 200-l-drum neutron coincidence counter. The counter has six shielded banks of ^3He tubes and JSR-11 shift register coincidence electronics. The modified design has a counting efficiency of 19.3%. The neutron counter measures the spontaneous-fission rate from the plutonium, and when this is combined with the plutonium isotopic ratios, we can determine the plutonium mass. The system includes the new multi-position add-a-source (AS) technique that uses a small ^{252}Cf source to determine the drum's matrix perturbation to the plutonium assay. The ^{252}Cf source is measured at three positions on the exterior of the drum to obtain the spatial distribution for the matrix correction. This manual gives the performance and calibration parameters. The matrix corrections by the AS technique are accurate to a few percent for typical applications.

12966 (LA–12742-MS) **LRAD-based airflow monitors.** Caress, R.W.; MacArthur, D.W.; Allander, K.S.; Bounds, J.A.; Catlett, M.M.; Garner, S.E.; Johnson, J.D.; Johnson, J.P.; Rutherford, D.A. Los Alamos National Lab., NM (United States). Mar 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007727. Source: OSTI; NTIS; GPO Dep.

Conventional alpha detectors depend upon detecting the alpha particle directly. This is often difficult because typical alpha particles generated by uranium or plutonium travel less than 3 cm in air. In contrast, the long-range alpha detector (LRAD) technology relies on detecting the ions generated by alpha particles as they lose their energy in air, rather than detecting the alpha particles themselves. We have designed, built, and used LRAD-based airflow monitors to detect alpha contamination. The airflow monitor is composed of a sample chamber with air and ion filters at one end and an ion detector at the opposite end. A set of small fans is located just outside the ion detector to provide an airflow that transports the ions into the ion detector. Ambient air enters through the particulate and ion filters, passes over and through an object located in the sample chamber, through the ion detector, then leaves the system through the fans. The number of ions present is proportional to the amount of contamination on the object's surface. This work describes the design, construction, and testing of the LRAD-based airflow monitors.

12967 (LAL-RT–93-02) **First application of a massively parallel system for on-line data processing in an H.E.P. experiment.** Auge, E.; Ducorps, A. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Apr 1993. 18p. Order Number DE94618213. Source: OSTI; NTIS (US Sales Only); INIS.

A study of the potential of a Massively Parallel Personal Computer (MPPC) machine in the data acquisition chain of an High Energy Physics Experiment is described. The purpose was to use such a machine to determine as fast as possible the pattern of the energy deposition in the cells of a calorimeter. It was also used for an on-line calculation of ADC pedestals. This work was part of an attempt to quantify the potential of Massively Parallel Processors in the second level trigger system of an experiment at the future LHC collider. In the framework of the MPPC collaboration, a prototype computer system called ASPA, was built and installed. The machine and the associated system software, as used in the present application, are described. (K.A.) 9 refs.; 6 figs.

12968 (LA-SUB–94-39) **The Los Alamos National Laboratory precision double crystal spectrometer.** Morgan, D.V. (Los Alamos National Lab., NM (United States)); Stevens, C.J.; Liefield, R.J. Los Alamos National Lab., NM (United States); New Mexico State Univ., Las Cruces, NM (United States). [1994]. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008075. Source: OSTI; NTIS; GPO Dep.

This report discusses the following topics on the LANL precision double crystal X-ray spectrometer: Motivation for construction of the instrument; a brief history of the instrument; mechanical systems; motion control systems; computer control system; vacuum system; alignment program; scan programs; observations of the copper $K\alpha$ lines; and characteristics and specifications.

12969 (LBL–35092) **Design and characterization of a pulsed x-ray source for fluorescent lifetime measurements.** Blankespoor, S.C. (Univ. of California, Berkeley, CA (United States). Dept. of Electrical Engineering and Computer Science). Lawrence Berkeley Lab., CA (United States). Dec 1993. 32p. Sponsored by USDOE, Washington, DC (United States);Whitaker Foundation (United States);Department of Health and Human Services, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant No. 5 T32 GM08155-07; P01 HL25840; R01 CA48002. Order Number DE94007495. Source: OSTI; NTIS; GPO Dep.

To search for new, fast, inorganic scintillators, the author and his colleagues have developed a bench-top pulsed x-ray source for determining fluorescent lifetimes and wavelengths of compounds in crystal or powdered form. This source uses a light-excited x-ray tube which produces x-rays when light from a laser diode strikes its photocathode. The x-ray tube has a tungsten anode, a beryllium exit window, a 30 kV maximum tube bias, and a 50 HA maximum average cathode current. The laser produces 3×10^7 photons at 650 nm per ~100 ps pulse, with up to 10^7 pulses/sec. The time spread for the laser diode, x-ray tube, and a microchannel plate photomultiplier tube is less than 120 ps fwhm. The mean x-ray photon energy, at tube biases of 20, 25, and 30 kV, is 9.4, 10.3, and 11.1 keV, respectively. They measured 140, 230, and 330 x-ray photons per laser diode pulse per steradian at tube biases of 20, 25, and 30 kV, respectively. Background x-rays due to dark current occur at a rate of 1×10^6 and 3×10^6 photons/sec/steradian at tube biases of 25 and 30 kV, respectively. Data characterizing the x-ray output with an aluminum filter in the x-ray beam are also presented.

12970 (MPI-PhE–93-21) **Optimization of the resolution of a track drift chamber (TPC).** Schoenfelder, S. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut; Muenchen Univ. (Germany). Fakultaet fuer Physik. Sep 1993. 83p. (In German). Order Number DE94747401. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of this diploma thesis it was studied, how the position resolution of a TPC can be improved. For this first properties like electron drift velocity as well transverse and longitudinal diffusion of different gases in a test TPC were determined. Starting from the measurement results it is possible, to select chamber gases with suitable drift velocity and low diffusion and to improve by this the position resolution of a TPC. The second essential point of approach for the improvement of the position resolution of a TPC was the variation of the TPC geometry. Here the pad width, the gap distance, and the sampling frequency was varied and the influence on the resolution studied. The essential result hereby was the development of a TPC with a gap distance of 1 mm, which reduced the pad response width to 1.4 mm and by this contributed to a distinct improvement of the position resolution. In a last step a gas microstrip chamber with TPC pad readout was designed, in which the amplification wire planes of the TPC were replaced by a microstrip structure on a glass substrae. Hereby the proof-of-principle of such a facility was brought and first measurements on the position resolution and on the time behaviour of the gas amplification performed. Looking out to the future further measurements with this facility, like for example variation of the substrate material, the substrate thickness, or the manufacturing process of the microstrip

structure for the improvement of the time stability of the gas amplification and the position resolution would be desirable. (HSI)

12971 (MPI-PhE–93-29) **Proposal to the Gran Sasso Laboratory for a dark matter search using cryogenic detectors.** Cooper, S. (Max-Planck-Institut fuer Physik, Muenchen (Germany)); Colling, P.; Ferger, P.; Frank, M.; Gebauer, H.J.; Nagel, U.; Nucciotti, A. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut. Nov 1993. 17p. Order Number DE94752162. Source: OSTI; NTIS (US Sales Only); INIS.

We request space and support from the Gran Sasso Laboratory for an experiment searching for dark matter WIMPs using cryogenic detectors. Our experiment is complementary to other dark matter searches in that it extends the sensitivity for WIMPs to the mass range below 10 GeV and that different target materials can be used within the same setup. The proposed experiment uses in the first stage a detector consisting of 1 kg of sapphire with a threshold of 0.5 keV and a resolution of 0.2 keV at 1 keV. The detector would be run at a temperature of 15-30 mK within a low-background setup. The first stage could be installed in 1995. The proposed setup allows for future expansion of the detector to 10-100 kg without major changes. (orig.)

12972 (NEI-SE–142) **Particles for testing the stack particle monitor of nuclear power plants.** Stroem, L. (Instrumentinvest, Nykoeping (Sweden)). Swedish Radiation Protection Inst., Stockholm (Sweden). May 1993. 8p. (In Swedish). Project SSI-P–693-92-2. Order Number DE94616487. Source: OSTI; NTIS; INIS.

The manufacture of particles for a simplified test procedure for the stack particle monitor of nuclear power plants has been studied. It was found that a kind of monodisperse polymer particles could be tagged with dysprosium. The particles can then be traced by means of activation analysis. The lower limit of detection appeared to be inconveniently high. The detection limit can probably be reduced, but airborne matter in the plants ventilation air might interfere. Porous particles were used in the experiments, to obtain a high dimensional stability. Stable solid particles are preferred.

12973 (NIIYaF-MGU–92-11-260) **Fast multifunctional spectrometer-identificator for charged particle study on satellites.** Mineev, Yu.V.; Kratenko, Yu.P.; Potorzhinskij, M.G.; Trofimov, P.N. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 20p. (In Russian). Order Number DE94616488. Source: OSTI; NTIS (US Sales Only); INIS.

Description is given of a spectrometer-identificator for studying fluxes and spectra of protons, electrons and light nuclei in the near-Earth space. Owing to application of the semiconductor detector system on the ΔE and E method and fast response electronics is developed the multifunctional and noise-immunity spectrometer-identificator. The instrument permits simultaneously and separately to detect the fluxes and spectra of electrons with energy of 0.04-2 MeV, protons of 0.5-100 MeV, alpha-particles of 4.5-90 MeV and light and middle nuclei with energy of 1-20 MeV/nucleon. 21 refs., 6 figs., 2 tabs.

12974 (NUREG/CR–4833) **Large area self-powered gamma ray detector: Phase 2, Development of a source position monitor for use on industrial radiographic units.** LeVert, F.E. (K.E.M.P. Corp., Knoxville, TN (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; K.E.M.P. Corp., Knoxville, TN (United States). Jan 1994. 36p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The purpose of this research was to develop a large area self-powered gamma detector (LASPGD) capable of detecting the movement of sealed radiation sources into and out of industrial radiographic units and to construct a prototype source position monitor (SPM) for these units utilizing the LASPGD. Prototype isotropic and directional LASPGDs, with solid and inert gas dielectrics, were developed and extensively tested using calibrated gamma sources (i.e., Cs-137, and Co-60). The sensitivities of the isotropic detectors, with inert gas dielectrics, were found to be approximately a factor of ten greater than those measured for the solid dielectric LASPGDs. Directionally sensitive self-powered detectors were found to exhibit a forward-to-back hemispherical sensitivity ratio of approximately 2 to 1. Industrial radiographic units containing Ir-192 sources with different activities were used to test the performance of the SPM. The SPM, which utilized a gas dielectric LASPGD, performed as designed. That is, the current generated in the LASPGD was converted to a voltage, amplified and used to control the on/off state of an incandescent lamp. The incandescent lamp, which functions as the source/out warning indicator, flashes at a rate of one flash per second when the source is in use (i.e. out of its shield).

12975 (ORNL/FTR–4866) **Travel to Switzerland and Germany to participate in WA98 at CERN and WA98 meeting in Darmstadt: Foreign trip report, November 7–28, 1993.** Plasil, F. Oak Ridge National Lab., TN (United States). 9 Dec 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94004459. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The traveler was responsible for initiating the setting up of test facilities at CERN for a group of ORNL staff members from the Instrumentation and Controls and Physics Divisions. Prototype electronics for the readout of 10,000 lead-glass detectors were tested at CERN, the site of the collaborative experiment WA98. Initial tests were carried out successfully in a newly commissioned laboratory near the experimental area. The traveler participated in the WA80/93/98 Collaboration Meeting, which was held at GSI, Darmstadt, Germany. An informal cost and schedule review of the lead-glass electronics project was carried out, and funding was secured from WA98 sources for the portion that is not covered by Department of Energy (DOE) resources.

12976 Method and apparatus for providing pulse pile-up correction in charge quantizing radiation detection systems. Britton, C.L. Jr.; Wintenberg, A.L. To Dept. of Energy. 1992. U.S. patent application 7-825,225. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007356. Source: OSTI; NTIS; INIS; GPO Dep.

This invention is comprised of a radiation detection method and system for continuously correcting the quantization of detected charge during pulse pile-up conditions. Charge pulses from a radiation detector responsive to the energy of detected radiation events are converted to voltage pulses of predetermined shape whose peak amplitudes are proportional to the quantity of charge of each corresponding detected event by means of a charge-sensitive preamplifier. These peak amplitudes are sampled and stored sequentially in accordance with their respective times of occurrence. Based on the stored peak amplitudes and times of occurrence, a correction factor is generated which represents the fraction of a previous pulses influence on a preceding pulse peak amplitude. This correction factor is subtracted from the following pulse amplitude in a summing amplifier whose output then represents the corrected charge quantity measurement.

12977 (SLAC-PUB–6390) **Gamma Large Area Silicon Telescope (GLAST).** Godfrey, G.L. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Nov 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9307166–1: 2. towards a major atmospheric Cerenkov detector workshop, Calgary (Canada), 17-18 Jul 1993). Order Number DE94006439. Source: OSTI; NTIS; INIS; GPO Dep.

The recent discoveries and excitement generated by EGRET have prompted an investigation into modern technologies ultimately leading to the next generation space-based gamma ray telescope. The goal is to design a detector that will increase the data acquisition rate by almost two orders of magnitude beyond EGRET, while at the same time improving on the angular resolution, the energy measurement of reconstructed gamma rays, and the triggering capability of the instrument. The GLAST proposal is based on the assertion that silicon particle detectors are the technology of choice for space application: no consumables, no gas volume, robust (versus fragile), long lived, and self triggering. The GLAST detector is roughly modeled after EGRET in that a tracking module precedes a calorimeter. The GLAST Tracker has planes of thin radiatior interspersed with planes of crossed-strip (x,y) 300-μm-pitch silicon detectors to measure the coordinates of converted electron-positron pairs. The gap between the layers (~5 cm) provides a lever arm in track fitting resulting in an angular resolution of 0.1° at

high energy (the low energy angular resolution at 100 MeV would be about 2°, limited by multiple scattering). A possible GLAST calorimeter is made of a mosaic of CsI crystals of order 10 r.l. in depth, with silicon photodiodes readout. The increased depth of the GLAST calorimeter over EGRET's extends the energy range to about 300 GeV.

12978 (UCRL-ID–115705) **CSC panel mass production technology R&D plan for SSC GEM Detector Muon Subsystem.** Pratuch, S.M. (and others); Clements, J.W.; Mauger, G.J. Lawrence Livermore National Lab., CA (United States). Nov 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007761. Source: OSTI; NTIS; GPO Dep.

A Cathode Strip Chamber (CSC), in the SSC GEM Detector Muon Subsystem, uses honeycomb panels to precisely position the cathode readout strips that define the volume of each detector layer. These panels also support and accurately position the anode wires within each detector layer. The largest panels are approximately 1.5 meters by 3.5 meters and 20 mm thick. The panel cross-section is illustrated in Figure 1. Each panel must remain flat to 100 microns over 1.5 meters, to meet physics objectives, while serving as a key structural component of the chamber assembly. The GEM Detector uses 1,128 CSC's ("24/36/48" configuration) requiring a total production of approximately 10,000 precision panels (8,088 plus spares). Mass production techniques are required which can produce the large number of panels for minimal cost and within a reasonable schedule while maintaining structural and stringent physics requirements. The goal of this R&D effort is to define, develop, and verify appropriate technologies that can be fashioned into an overall fabrication process for mass production of CSC panels. In addition, panel design features are evaluated which aid in CSC assembly and internal alignment.

12979 (UCRL-JC–115217) **The superconducting solenoid magnet system for the GEM detector at the SSC.** Deis, G. (and others); Bowers, J.; Chargin, A. Lawrence Livermore National Lab., CA (United States); Universities Research Association, Waxahachie, TX (United States); Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). 8 Sep 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC35-89ER40486 ; AC05-84OR21400. (CONF-930926–30: 13. international conference on magnet technology, Victoria (Canada), 20-24 Sep 1993). Order Number DE94007442. Source: OSTI; NTIS; GPO Dep.

The design of the magnet for the GEM detector at the SSC is described. It is an 18m inner diameter, 30m long superconducting solenoid, with a magnetic field of 0.8T. The basic solenoidal field is shaped by large ferromagnetic cones, to improve detector performance in the ends of the solenoid. Because of the system's large size and mass, field-fabrication on-site at SSC is required. The challenges in this process, together with the large stored energy of the system, 2.5 GJ, have lead to novel design choices in several areas, including the conductor. The design of the conductor, cold mass, vacuum vessel, cold mass supports, thermal shields, forward field shapers, and auxiliary systems are described.

12980 (UCRL-JC–115703) **Non-intrusive, nuclear component discrimination with a micro-channel plate gamma-ray detector.** Rowland, M. Lawrence Livermore National Lab., CA (United States). Nov 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931107–33: 1993 IEEE nuclear science symposium and medical imaging conference, San Francisco, CA (United States), 2-5 Nov 1993). Order Number DE94006191. Source: OSTI; NTIS; GPO Dep.

We describe the function of a micro-channel plate gamma-ray detector designed for non-intrusive detection of physically obscured special nuclear material (SNM), including nuclear weapons. An example application of such a detector is a cooperative inspection distinguishing between nuclear and non-nuclear weapons where legitimate numbers of each may be present. In this type of scenario, the information needed would be the number of each type of weapon. Another example scenario would be a weapon-type classification based on a benchmarked gamma-ray count rate from each package type (nuclear type A or nuclear type B). In both of these scenarios, we desire the location of nuclear weapons.

12981 (UCRL-JC–115791) **Imaging AMS.** Freeman, S.P.H.T. (Univ. of Oxford (United Kingdom)); Ramsey, C.B.; Hedges, R.E.M. Lawrence Livermore National Lab., CA (United States). Dec 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930960–9: 6. international conference on accelerator mass spectrometry, Canberra (Australia), 17 Sep - 1 oct 1993). Order Number DE94006662. Source: OSTI; NTIS; GPO Dep.

The benefits of simultaneous high effective mass resolution and large spectrometer acceptance that accelerator mass spectrometry has afforded the bulk analysis of material samples by secondary ion mass spectrometry may also be applied to imaging SIMS. The authors are exploring imaging AMS with the addition to the Oxford ^{14}C-AMS system of a scanning secondary ion source. It employs a sub micron probe and a separate Cs flood to further increase the useful ion yield. The source has been accommodated on the system by directly injecting sputtered ions into the accelerator without mass analysis. They are detected with a range of devices including new high-bandwidth detectors. Qualitative mass spectra may be easily generated by varying only the post-accelerator analysis magnet. Selected ion signals may be used for imaging. In developing the instrument for bioscience research the authors are establishing its capability for measuring the lighter elements prevalent in biological tissue. Importantly, the machine can map the distributions of radiocarbon labeled compounds with an efficiency of about 1‰. A background due to misidentification of non-^{14}C ions as a result of the reduced ion mass filtering is too small to hinder high magnification microscopy.

12982 (VAEC-B–020) **Method of N-15 analysis by mass-spectroscopy on ion implanter MPB-200.** Vo Van Thuan (Inst. of Nuclear Science and Technology, Hanoi (Viet Nam)); Dang Duc Nhan; Nguyen Phuc; Nguyen Tien Dung; Nguyen Van Dach. Viet Nam National Atomic Energy Commission, Ha Noi (Viet Nam). 22 Nov 1993. 11p. Order Number DE94618203. Source: OSTI; NTIS (US Sales Only); INIS.

Preprint.

The industrial implanter MPB-200 has been modified to a light-isotope mass spectrometer. Mass-resolution has been improved by combination of quadrupole focusing system and a collimator with additional scattering shielding. Single beam method has been set up, in which mass-spectrum are obtained by scanning magnetic field of the separator. A start-stop control system has been added to operate automatically the magnet and registration system, from which signals are transferred to a XT/AT computer for saving and analysis. The mass-resolution is satisfactory for analysis of light isotopes with mass number A less than 40. A testing measurement has been done with standard samples of natural and enriched N-15 isotope, at acceleration energy of 50 keV, beam current less than 100 nA, vacuum of 4x10E-6 and collimator's shell of 1 mm. Obtained resolution and background condition allowed to achieve a good linear dependence of relative isotope ratio data vs real abundance in the range from natural 0.365% to 5.0% with a 3% error (96% of reliability). Routine N-15 may achieve (5-10)% accuracy by a 7-10 minutes measurement for every sample. Sensitivity of the mass-spectrometer is better almost by one order in comparing with one of emission spectrometers. The new mass-spectroscopy system is applied to research in agriculture, biology and environmental study. (author). 4 refs, 4 figs.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

Refer also to citation(s) 12922, 12941, 13023, 14205

12983 (INIS-mf–13749, pp. 21) **Picosecond Nd:Glass laser for the experiments on interaction of matter with a super intense laser field.** Ganeev, R.A. (NOP Akadempribor, Academy of Sciences of Uzbekistan, Akademgorodok, Tashkent (Uzbekistan)); Ganikhanov, F.SH.; Redhorechev, V.I.; Usmanov, T.; Khusainov, I.A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–:

2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER RADIATION; AMPLIFICATION; ENERGY YIELD; NEODYMIUM LASERS; PULSES

12984 (INIS-mf–13749, pp. 81) **Application of an argon laser for photofabrication of three dimensional solid surfaces.** Vaezi-Nejad, S.M. (University of Greenwich, London (United Kingdom). School of Engineering); Shams, I. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRONIC CIRCUITS/lasers; LASERS; USES

4404 Well Logging Instrumentation

Refer also to citation(s) 11534

4406 Optical Instrumentation

Refer also to citation(s) 12709, 12757, 13020, 13050, 13422

12985 (PNL-SA–22151) **Millimeter wave, high-resolution, holographic surveillance system.** McMakin, D.L.; Sheen, D.M.; Collins, H.D.; Hall, T.E.; Smith, R.R.; Droppo, J.G. Jr. Pacific Northwest Lab., Richland, WA (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States);Federal Aviation Administration, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9310164–8: International symposium on substance identification technologies, Innsbruck (Austria), 4-8 Oct 1993). Order Number DE94004289. Source: OSTI; NTIS; GPO Dep.

Millimeter wave holographic imaging systems capable of imaging through clothing to detect contraband, metal, plastic, or ceramic weapons may provided a practical solution to personnel inspection needs in mass transportation centers. Traditional inspection systems, such as metal detectors and x-ray imaging systems, have limitations for the detection of concealed weapons. metal detectors are limited because they cannot detect plastic weapons and x-ray imaging systems are limited in use due to radiological health considerations. A prototype millimeter wave holographic surveillance system has been developed and demonstrated at the Pacific Northwest Laboratory (PNL). The prototype millimeter wave holographic surveillance system developed at PNL consists of a sequentially switched 2 x 64 element array coupled to a 35 GHz bi-static transceiver. The sequentially switched array of antennas can be used to obtain the holographic data at high speed by electonically sequencing the antennas along one dimension and performing a mechanical scan along the other dimension. A one-dimensional mechanical scan be be performed in about one second. The prototype system scans an aperture of 0.75 by 2.05. This system has been demonstrated and images have been obtained on volunteers at Sea-Tac International airport in Seattle, Washington.

12986 (SAND–93-1274C) **Analysis of the photodiode boundary layer transition indicator.** Kuntz, D.W.; Wilken, A.C.; Payne, J.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (AIAA–94-0454; CONF-940152–2: 32. aerospace sciences meeting and exhibit, Reno, NV (United States), 11-14 Jan 1994). Order Number DE94005311. Source: OSTI; NTIS; GPO Dep.

The photodiode transition indicator is a device which has been successfully used to determine the onset of boundary layer transition on numerous hypersonic flight vehicles. The exact source of the electromagnetic radiation detected by the photodiode at transition was not understood. In some cases early saturation of the device occurred, and the device failed to detect transition. Analyses have been performed to determine the source of the radiation producing the photodiode signal. The results of these analyses indicate that the most likely source of the radiation is blackbody emission from the heatshield material bordering the quartz window of the device. Good agreement between flight data and calculations based on this radiation source has been obtained. Analyses also indicate that the most probable source of the radiation causing early saturation is blackbody radiation from carbon particles which break away from the nosetip during the ablation process.

12987 (UCRL-JC–114837) **Design and early results of the sodium-layer laser guide star adaptive optics experiment at the Lawrence Livermore National Laboratory.** Gavel, D.T. (and others); Max, C.E.; Avicola, K. Lawrence Livermore National Lab., CA (United States). 30 Jul 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9308215–1: ICO-16 satellite conference on active and adaptive optics, Garching (Germany), 2-5 Aug 1993). Order Number DE94006653. Source: OSTI; NTIS; INIS; GPO Dep.

Adaptive optic systems promise to give diffraction limited performance to ground based telescopes operating at visible and near infrared wavelengths. However, because of the short spatial scale of atmospheric turbulence, the corrected field of view is limited to only a few arc seconds in the visible, to perhaps 10 arc seconds at L band (3.5 μ). A bright point source must be in this field of view as a wavefront reference, but the number density of natural stars is too small for full sky coverage at imaging wavelengths less than 3μ. A sufficiently bright point source can be artificially generated by a laser however, and investigations into the use of laser beacons has been proceeding for some time now. Our experiments at Livermore have concentrated on the formation of guide stars in the sodium mesospheric layer at 90 km altitude. We have also designed and built adaptive optics systems that use both artificial and natural guide stars. Experimental results to date have shown great promise for the practicality of this technique in astronomy.

12988 (UCRL-JC–116148) **Automated fiber pigtailing technology.** Strand, O.T.; Lowry, M.E.; Lu, S.Y.; Nelson, D.C.; Nikkel, D.J.; Pocha, M.D.; Young, K.D. Lawrence Livermore National Lab., CA (United States). Feb 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940596–1: 44. electronic components and technology conference, Washington, DC (United States), 1-4 May 1994). Order Number DE94007072. Source: OSTI; NTIS; GPO Dep.

The high cost of optoelectronic (OE) devices is due mainly to the labor-intensive packaging process. Manually pigtailing such devices as single-mode laser diodes and modulators is very time consuming with poor quality control. The Photonics Program and the Engineering Research Division at LLNL are addressing several issues associated with automatically packaging OE devices. A furry automated system must include high-precision fiber alignment, fiber attachment techniques, in-situ quality control, and parts handling and feeding. This paper will present on-going work at LLNL in the areas of automated fiber alignment and fiber attachment. For the fiber alignment, we are building an automated fiber pigtailing machine (AFPM) which combines computer vision and object recognition algorithms with active feedback to perform sub-micron alignments of single-mode fibers to modulators and laser diodes. We expect to perform sub-micron alignments in less than five minutes with this technology. For fiber attachment, we are building various geometries of silicon microbenches which include on-board heaters to solder metal-coated fibers and other components in place; these designs are completely compatible with an automated process of OE packaging. We have manually attached a laser diode, a thermistor, and a thermo-electric heater to one of our microbenches in less than 15 minutes using the on-board heaters for solder reflow; an automated process could perform this same exercise in only a few minutes. Automated packaging techniques such as these will help lower the costs of OE devices.

4408 Miscellaneous Instrumentation

Refer also to citation(s) 11488, 11768, 12426, 12452, 12629, 12997, 13001, 13328

12989 (BARC–1993/E/020) **An indigenously developed photoacoustic spectrometer for study of actinide spectroscopy.** Dhobale, A.R. (Bhabha Atomic Research Centre, Bombay (India). Radiochemistry Div.); Kumar, Mithlesh; Page, A.G.; Sastry, M.D. Bhabha Atomic Research Centre, Bombay (India). 1993. 30p. Order Number DE94616508. Source: OSTI; NTIS (US Sales Only); INIS.

A photoacoustic spectrometer has been designed and fabricated. The indigenously developed unit has been successfully tested for its performance features and compares well with the commercially available units. Due to the modular nature of the spectrometer assembly, the instrument can be easily adapted to study actinide spectroscopy. The unit is being extensively used to record absorption spectra of opaque solids. Apart from the normal use to study non-radiative spectral transitions, the spectrometer is fruitfully utilized in speciation studies for uranium and for studying structural phase transitions in Lisub(1-x)H_xNbO_3. (author). 11 refs., 10 figs.

12990 (EML–558) **Low power, constant-flow air pump systems.** Polito, M.D.; Albert, B. USDOE Environmental Measurements Lab., New York, NY (United States). Jan 1994. 28p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007463. Source: OSTI; NTIS; GPO Dep.

A rugged, yet small and lightweight constant-flow air pump system has been designed. Flow control is achieved using a novel approach which is three times more power efficient than previous designs. The resultant savings in battery size and weight makes these pumps ideal for sampling air on balloon platforms. The pump package includes meteorological sensors and an onboard computer that stores time and sensor data and turns the constant-flow pump circuit on/off. Some applications of these systems are also presented in this report.

12991 (JINR-D–13-93-222) **A circuit for fast automatic search for resonance and tuning to it in a nuclear magnetometer.** Ivashkevich, S.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 7p. Order Number DE94618238. Source: OSTI; NTIS (US Sales Only); INIS.

The description is presented of the principle of action of an automatic search-lock-track nuclear magnetometer circuit with a fast search for NMR. The schematic diagram of the magnetometer, in which the above-mentioned circuit is used, is given, as well as some characteristics of this magnetometer, such as: search time - 3 s, the absolute precision achievable in measuring the magnetic field in automatic mode - 0.001%, the range of the measured fields - up to 6 T (may be up to 10 T) with proton resonance, etc. 6 refs.; 2 figs.

12992 Ultrasonic fluid flow measurement method and apparatus. Kronberg, J.W. To Dept. of Energy. 1992. U.S. patent application 7-832,567. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007350. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of an apparatus for measuring the flow of a fluid in a pipe using ultrasonic waves. The apparatus comprises an ultrasonic generator, a lens for focusing the sound energy produced by the generator, and means for directing the focused energy into the side of the pipe through an opening and in a direction close to parallel to the long axis of the pipe. A cone carries the sound energy to the lens from the generator. Depending on the choice of materials, there may be a quarter-wave, acoustic impedance matching section between the generator and the cone to reduce the reflections of energy at the cone boundary. The lens material has an acoustic impedance similar to that of the cone material but a different sonic velocity so that the lens can converge the sound waves in the fluid. A transition section between the lens and the fluid helps to couple the energy to the fluid and assures it is directed as close to parallel to the fluid flow direction as possible.

12993 Crack detection using resonant ultrasound spectroscopy. Migliori, A.; Bell, T.M. To Dept. of Energy. 1992. U.S. patent application 7-834,747. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007348. Source: OSTI; NTIS; GPO Dep.

This invention is comprised of a method and apparatus for detecting crack-like flaws in components. A plurality of exciting frequencies are generated and applied to a component in a dry condition to obtain a first ultrasonic spectrum of the component. The component is then wet with a selected liquid to penetrate any crack-like flaws in the component. The plurality of exciting frequencies are again applied to the component and a second ultrasonic spectrum of the component is obtained. The wet and dry ultrasonic spectra are then analyzed to determine the second harmonic components in each of the ultrasonic resonance spectra and the second harmonic components are compared to ascertain the presence of crack-like flaws in the component.

12994 (PNL-SA–22301) **Ultra wide band radar holographic imaging of subsurface targets.** Collins, H.D.; Gribble, R.P. Pacific Northwest Lab., Richland, WA (United States). Aug 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9308167–6: 20. annual review of progress in quantitative nondestructive evaluation (NDE), Brunswick, ME (United States), 1-6 Aug 1993). Order Number DE94004271. Source: OSTI; NTIS; GPO Dep.

This report discusses ultra wide band (i.e., 60 ps impulse) radar holography which is a unique technique for imaging subsurface targets with extremely high lateral and depth resolution. The large frequency bandwidth, typically 100%, provides excellent depth resolution and the synthetic aperture optimum lateral resolution of one-half wavelength at the center pulse frequency. Radar impulse holography can simply be described as a multi-frequency detection and imaging technique where the target's broadband time waveform signals are recorded over a defined aperture; decomposed into their discrete frequency components as single frequency holograms, and reconstructed into a composite image. Computer generated holograms are constructed for each frequency component in the 3-dB pulse bandwidth and plane wave angular spectrums computed to provide unique detection analysis with respect to target identification, etc. The hologram at each frequency component in the pulse can be thought of as a diffraction lens for each reflecting point on the target. A complex target consists, of a multitude of points, and the recorded hologram becomes the superposition of these individual diffraction lens. It is a unique diffraction pattern capable of defining the target's image and scattering characteristics in the near- and far-field.

12995 (UCRL-JC–114145) **AMS beyond 2000.** Davis, J.C. Lawrence Livermore National Lab., CA (United States). 28 Dec 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930960–8: 6. international conference on accelerator mass spectrometry, Canberra (Australia), 17 Sep - 1 oct 1993). Order Number DE94006666. Source: OSTI; NTIS; GPO Dep.

The occasion of this conference, the Sixth International Conference on Accelerator Mass Spectrometry, falls sixteen years after the remarkable triple simultaneous discovery of this powerful isotopic measurement. In the interval since the Fifth Conference in Paris in 1991, new facilities of both large and small size have become fully operational, achieving impressive gains in both measurement throughput and precision. The purpose of this short review is to extrapolate from recent gains and experience and to project the status of the field beyond the coming millennial date. AMS achieved instant application in archaeology and the geosciences and its early growth was stimulated by the excitement caused by the early results. The ability to obtain an accurate radiocarbon date with a sample one thousand times smaller than possible with scintillation or gas counting, the ability to trace $^{14}CO_2$ in sea water with a similar thousand fold shrinkage in sample size, and the wide utility of ^{10}Be, ^{26}Al, ^{36}Cl, and ^{129}I as tracers and chronometers of erosion, hydrology and paleoclimate were sufficient to drive the partial conversion of existing accelerators and the construction of new dedicated ones. These applications remain the core of the present field and continue to justify its growth. The past few years, however, have seen developments in new fields. Biomedicine, chemical kinetics, materials science, forensic dosimetry, and arms control/counter proliferation have been explored. These applications have varying promise and will influence development of AMS programs in new ways in the future.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

Refer also to citation(s) 12428, 12465, 12810, 12825

12996 (DOE/CE/90053–T60) **Interagency Advanced Power Group, Joint Electrical and Nuclear Working Group, meeting minutes, November 16–17, 1993.** Horizon Data Corp., Reston, VA (United States). Power Information Center. [1993]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-90CE90053. Order Number DE94007949. Source: OSTI; NTIS; GPO Dep.

Reports on soldier power R&D review, N-MCT power electronic building blocks, silicon carbide power semiconductor work, and ground based radar were made to the Power Conditioning Panel. An introduction to high temperature electronics needs, research and development was made to the High Temperature Electronics Subcommittee. The Pulse Power Panel received reports on the navy ETC gun, and army pulse power. The Superconductivity Panel received reports on high-tc superconducting wires, superconducting magnetic energy storage, and superconducting applications. The Nuclear Working Group received presentations on the Topaz nuclear power program, and space nuclear work in the Department of Energy.

12997 (SAND–93-2413C) **An investigation of airborne GPS/INS for high accuracy position and velocity determination.** Sun, H. (Calgary Univ., AB (Canada). Dept. of Geomatics Engineering); Cannon, M.E.; Owen, T.E.; Meindl, M.A. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940158–1: Institute of Navigation national technical meeting, San Diego, CA (United States), 24-26 Jan 1994). Order Number DE94006139. Source: OSTI; NTIS; GPO Dep.

An airborne test using a differential GPS-INS system in a Twin Otter was conducted by Sandia National Laboratories to assess the feasibility of using the integrated system for cm-level position and cm/s velocity. The INS is a miniaturized ring-laser gyro IMU jointly developed by Sandia and Honeywell while the GPS system consists of the NovAtel GPSCard™. INS position, velocity and attitude data were computed using Sandia's SANDAC flight computer system and logged at 4 Hz and GPS data was acquired at a 1 Hz rate. The mission was approximately 2.5 hours in duration and the aircraft reached separations of up to 19 km from the base station. The data was post-processed using a centralized Kalman filter approach in which the double differenced carrier phase measurements are used to update the INS data. The INS position is in turn used to detect and correct GPS carrier phase cycle slips and also to bridge GPS outages. Results are presented for the GPS-only case and also for integrated GPS/INS.

12998 (SAND–93-4040C) **Feature discovery in gray level imagery for one-class object recognition.** Koch, M.W.; Moya, M.M. Sandia National Labs., Albuquerque, NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9306304–1: Institute of Electrical and Electronics Engineers (IEEE) world congress on computational intelligence, Orlando, FL (United States), 26 Jun - 2 jul 1993). Order Number DE94005268. Source: OSTI; NTIS; GPO Dep.

Feature extraction transforms an object's image representation to an alternate reduced representation. In one-class object recognition, we would like this alternate representation to give improved discrimination between the object and all possible non-objects and improved generation between different object poses. Feature selection can be time-consuming and difficult to optimize so we have investigated unsupervised neural networks for feature discovery. We first discuss an inherent limitation in competitive type neural networks for discovering features in gray level images. We then show how Sanger's Generalized Hebbian Algorithm (GHA) removes this limitation and describe a novel GHA application for learning object features that discriminate the object from clutter. Using a specific example, we show how these features are better at distinguishing the target object from other nontarget object with Carpenter's ART 2-A as the pattern classifier.

12999 (SAND–93-8221) **Tearing resistance of a thin shell against projectile penetration: Material property effects.** Trinh, K.V. Sandia National Labs., Livermore, CA (United States). Jan 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94007466. Source: OSTI; NTIS; GPO Dep.

This report presents results from a series of finite element analyses performed to study material effects on the tearing resistance of a thin shell subjected to projectile penetration. These analyses simulated a round, slender projectile impacting the top center of a metallic cylindrical shell at high speed. We varied eight selected shell material properties systematically using an L18 matrix (design of experiment technique). From the results, we determined effects of the eight properties on the minimum projectile velocity required to penetrate the shell. The material properties examined here included: yield strength, hardening and recovery characteristics, heat coefficient, initial porosity, and damage exponent (a void growth parameter). The DYNA2D finite element code along with the Sandia plasticity/damage model for ductile metals were used in the analyses.

13000 (UCRL-JC–115710) **Updated test results of a pumped monopropellant propulsion system.** Maybee, J.C. (Rocket Research Co., Redmond, WA (United States)); Swink, D.G.; Whitehead, J.C. Lawrence Livermore National Lab., CA (United States). 16 Dec 1993. 16p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9311141–2: 30. joint Army, Navy, NASA, Air Force (JANNAF) combustion meeting, Monterey, CA (United States), 15-19 Nov 1993). Order Number DE94006401. Source: OSTI; NTIS; GPO Dep.

Significant progress was made in 1992 and 1993 towards demonstration at the system level of a high-performance pumped monopropellant propulsion system. Two separate breadboard systems were designed, fabricated and tested with hydrazine at vacuum and sea level conditions. Both designs utilized improved warm-gas-driven reciprocating pumps to transfer fuel from a low-pressure hydrazine tank (70 psig) directly to a pair of 56-lbf thrusters operating at 580 psia chamber pressure. The system most recently tested included direct warm gas pressurization of the hydrazine tank. This novel propulsion system design has been presented and discussed in various configurations in previous papers. This paper will provide an update to test results presented in 1991. The recent testing of these latest system designs included a continuous 60-second burn of a 42-lbf thruster operating at sea level, in addition to bootstrap and pulse- mode firings. These results have demonstrated that improvements to the 3-way valve design of the pump were successful, and have verified performance predictions obtained from a mathematical model of the system. Further testing of a more advanced breadboard system is planned for late 1993.

4501 Chemical Explosions and Explosives

Refer also to citation(s) 13414

13001 (EGG–11265-5013) **An automated target recognition technique for image segmentation and scene analysis.** Baumgart, C.W.; Ciarcia, C.A. EG and G Energy Measurements, Inc., Los Alamos, NM (United States). Los Alamos Operations. [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. (CONF-940483–2: 16. SPIE thermosense: international conference on thermal sensing and imaging and diagnostic applications, Orlando, FL (United States), 4-8 Apr 1994). Order Number DE94006479. Source: OSTI; NTIS; GPO Dep.

Automated target recognition software has been designed to perform image segmentation and scene analysis. Specifically, this software was developed as a package for the Army's Minefield and Reconnaissance and Detector (MIRADOR) program. MIRADOR is an on/off road, remote control, multi-sensor system designed to detect buried and surface-emplaced metallic and non-metallic antitank mines. The basic requirements for this ATR software were: (1) an ability to separate target objects from the background in low S/N conditions; (2) an ability to handle a relatively high dynamic

range in imaging light levels; (3) the ability to compensate for or remove light source effects such as shadows; and (4) the ability to identify target objects as mines. The image segmentation and target evaluation was performed utilizing an integrated and parallel processing approach. Three basic techniques (texture analysis, edge enhancement, and contrast enhancement) were used collectively to extract all potential mine target shapes from the basic image. Target evaluation was then performed using a combination of size, geometrical, and fractal characteristics which resulted in a calculated probability for each target shape. Overall results with this algorithm were quite good, though there is a trade-off between detection confidence and the number of false alarms. This technology also has applications in the areas of hazardous waste site remediation, archaeology, and law enforcement.

13002 (LA–12748-MS) **Explosive performance on the non-proliferation experiment.** McKown, T.O. Los Alamos National Lab., NM (United States). Mar 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007724. Source: OSTI; NTIS; GPO Dep.

The non-proliferation experiment, originally called the chemical kiloton experiment, was planned and executed by Lawrence Livermore National Laboratory to investigate the seismic yield relationship and distinguishing seismic signals between a nuclear event and a large mass conventional explosion. The Los Alamos National Laboratory planned and conducted experiments to further their studies of the source function for signals observed seismically. Since all investigations were contingent on the performance of the emplaced chemical explosive, an array of diagnostic measurements was fielded in the emplaced explosive. The CORRTEX system was used to investigate the explosive initiation and to determine the detonation velocities in multiple levels and in numerous directions. A description of the CORRTEX experiments fielded, a review of the data obtained and some interpretations of the data are reported.

13003 (LA-UR–94-444) **An engineered system using base hydrolysis for complete disposal of energetic materials.** Spontarelli, T.; Buntain, G.A.; Flesner, R.L.; Sanchez, J.A.; Unkefer, P.J. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940348–3: International symposium on energetic materials technology and exhibits, Orlando, FL (United States), 21-24 Mar 1994). Order Number DE94007529. Source: OSTI; NTIS; GPO Dep.

In dismantling weapons from stockpile reduction, environmentally acceptable methods to degrade the associated high explosive (BE) waste to non-energetic forms is a critical objective. Base hydrolysis appears to be a safe, simple, and inexpensive method for converting energetic materials (EN-MATs) into non-energetic materials. We have demonstrated that many EN-MATs can be hydrolyzed with aqueous sodium hydroxide or ammonia at temperatures ranging from 60 to 150°C. We have decomposed molding powder, pressed charges up to 3.5 kg in weight, and partially exposed, metal-encased pieces. The decomposition products consist mainly of organic and inorganic salts, e.g., sodium formate, acetate, nitrite and nitrate. The major gaseous product from the base hydrolysis of EN-MATs is nitrous oxide. The time required for complete EN-MAT destruction varies with the material being hydrolyzed, but typically takes four to five hours at atmospheric pressure. Products from base hydrolysis can be further degraded using biotreatment or supercritical water oxidation.

13004 (PNL-SA–23614) **Attached charge enhancement system (ACES).** Cliff, W.C. (Pacific Northwest Lab., Richland, WA (United States)); Bampton, M.C.C.; Holmes, J.D.; Greenlee, D.W.; Donahue, S.A. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 10p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940164–1: Counter proliferation technical conference, Colorado Springs, CO (United States), 25-27 Jan 1994). Order Number DE94007484. Source: OSTI; NTIS (US Sales Only); GPO Dep.

It has been theorized since 1939 that the velocity and range of gun-launched projectiles could be substantially increased by burning an attached combustion material at the base of a projectile thereby maintaining a higher base pressure on the projectile throughout its in-bore travel and increasing muzzle velocity. Many theoretical studies have been carried out since that time showing the possibility of substantial improvement. However, in a thorough review of the history of research seeking an effective "traveling charge" projectile entitled TRAVELING CHARGE EFFECT, by Ballistic Research Laboratory (BRL) personnel in GUN PROPULSION TECHNOLOGY, Vol. 109, 1988, the authors state that "proof of a well-defined combustion zone moving with the attached propellant does not yet exist." The principal reason for failure in the past appears to have been that the propellants fragmented in the breech area and did not remain with the projectile. This in effect causes the "traveling charge propellant" to act as a conventional breech propellant. The attached charge (AC) concept requires that the propellant remain attached to the base of the projectile or associated pusher system and burn only on its exposed surfaces. That is, the flame front is not permitted to penetrate through the propellant. The following is the definition of attached charge as represented in this paper: "The attached charge is a chemical propulsion technology for gun launched projectiles, in which a portion of the propellant is permanently affixed to a receptacle within the projectile or in a separate "pusher" container and exhausts gases rearward maintaining a high base pressure on the projertile as well as providing some momentum thrust on the projectile assembly. As the projectile assembly progresses down the gun tube, the attached charge propellant should be fully consumed prior to muzzle exit so that the gun tube remains the aiming device."

13005 (SAND–91-1262) **Preliminary characteristics and development report MC4231 Cap Release, MC4248 Actuator.** Hart, E.J.; Hingorani, S.L. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94006636. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The MC4231 Cap Release was designed and developed for use on the B90 Nuclear Depth Strike Bomb (NDSB) until weapon system cancellation in 1991. It was designed as a component subassembly of the MC4225 Contact-Entry Detector, which contains water sensors that are used to detect water entry of the B90. The detection of water entry dispatches a signal used to jettison the parachute and initiate a sequence of events in the weapon system. The purpose of the MC4231 is to provide a protective cap for the MC4225 flow tube and water sensors during weapon system storage and delivery, until the water sensors are needed for water entry detection. Prior to water entry of the B90, the MC4231 is functioned by a pyrotechnic actuator, the MC4248, which ejects the protective cap, thereby allowing the detection by the water sensors of weapon system water entry. The purpose of this report is to document the preliminary design intent, component characteristics, development history, and test results for the MC4231 Cap Release and the MC4248 Actuator.

13006 (SAND–93-2040C) **Three-dimensional shock wave physics simulations with PCTH on the paragon parallel computer.** Gardner, D.R.; Fang, H.E. Sandia National Labs., Albuquerque, NM (United States). [1993]. 6p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940428–1: High performance computing '94: grand challenges in computer simulation, La Jolla, CA (United States), 11-15 Apr 1994). Order Number DE94006355. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The numerical modeling of penetrator-armor interactions and other high-energy events requires the detailed, three-dimensional simulation of complex interactions of exotic materials at high energies. To perform such simulations, Sandia scientists have developed a multiple-instruction, multiple-data (MIMD) shock wave physics code named PCTH. PCTH includes a variety of models for material strength, fracture, and the detonation of high explosives. PCTH is written in C++ making extensive use of the techniques of object-oriented numerics to facilitate code development maintenance, and extension. We describe several large simulations conducted with PCTH on Sandia's Intel Paragon X/PS parallel computer, and discuss the performance of the code. The scaled speedups for PCTH on the 1840-processor Paragon, measured as the simulation size is increased with the number of processors,

demonstrate that high performance and parallel efficiencies of nearly 90% can be achieved for realistic problems. These simulations demonstrate that massively parallel shock physics codes can provide rapid, highly-detailed, three-dimensional simulations of real-world problems.

13007 (SAND–93-2073) **Using Monte Carlo techniques and parallel processing for debris hazard analysis of rocket systems.** LaFarge, R.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007250. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories has been involved with rocket systems for many years. Some of these systems have carried high explosive onboard, while others have had FTS for destruction purposes whenever a potential hazard is detected. Recently, Sandia has also been involved with flight tests in which a target vehicle is intentionally destroyed by a projectile. Such endeavors always raise questions about the safety of personnel and the environment in the event of a premature detonation of the explosive or an activation of the FTS, as well as intentional vehicle destruction. Previous attempts to investigate fragmentation hazards for similar configurations have analyzed fragment size and shape in detail but have computed only a limited number of trajectories to determine the probabilities of impact and casualty expectations. A computer program SAFETIE has been written in support of various SNL flight experiments to compute better approximations of the hazards. SAFETIE uses the AMEER trajectory computer code and the Engineering Sciences Center LAN of Sun workstations to determine more realistically the probability of impact for an arbitrary number of exclusion areas. The various debris generation models are described.

13008 (SAND–93-3792) **Assessment of hoist failure rate for Payload Transporter III.** Demmie, P.N. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007753. Source: OSTI; NTIS; GPO Dep.

Assessment of the hoist failure rate for the Payload Transporter Type III (PT-III) hoist was completed as one of the ground transportation tasks for the Minuteman II (MMIII) Weapon System Safety Assessment. The failures of concern are failures that lead to dropping a reentry system (RS) during hoist operations in a silo or the assembly, storage, and inspection building for a MMIII wing. After providing a brief description of the PT-III hoist system, the author summarizes his search for historical data from industry and the military services for failures of electric hoist systems. Since such information was not found, the strategy for assessing a failure rate was to consider failure mechanisms which lead to load-drop accidents, estimate their rates, and sum the rates for the PT-III hoist failure rate. The author discusses failure mechanisms and describes his assessment of a chain failure rate that is based on data from destructive testing of a chain of the type used for the PT-III hoist and projected usage rates for hoist operations involving the RS. The main result provides upper bounds for chain failure rates that are based on these data. No test data were found to estimate failure rates due to mechanisms other than chain failure. The author did not attempt to quantify the effects of human factors on the PT-III hoist failure rate.

13009 (UCRL-ID–116389) **Destruction of XM-46 (aka LGP-1846) using the Molten Salt Destruction Process.** Upadhye, R.S.; Watkins, B.E. Lawrence Livermore National Lab., CA (United States). Mar 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008311. Source: OSTI; NTIS; GPO Dep.

The experimental work done on the destruction of the liquid gun propellant XM-46 (or LGP-1846) using the Molten Salt Destruction (MSD) Process at the Lawrence Livermore National Laboratory (LLNL) for the US Army is described in this report. The current methods of disposal of large quantities of high explosives (HE), propellants and wastes containing energetic materials by open burning or open detonation (OB/OD), or by incineration, are becoming undesirable. LLNL is developing MSD as an alternative to OB/OD and incineration of energetic materials. A series of 18 continuous experimental runs were made wherein a solution of XM-46 and water was injected into a bed of molten salt comprising the carbonates of sodium, potassium and lithium, along with air. The results from these experiments, described in detail in the main body of this report, show that: XM-46 can be safely and completely destroyed in a bed of molten salt at temperatures well below those needed for incineration. Under optimum operating conditions, less than 1% of the chemically bound nitrogen in the XM-46 is converted to NO_x, and less than 1% carbon is converted to CO. There exist, however, a number of technical uncertainties: We need to understand better why nitrates build up in the salt bath, and what we can do to reduce this amount. We need to understand the mechanism of XM-46 oxidation and ways to minimize the formation of CO and NO_x. In addition, we would like to find out ways by which a more concentrated solution of XM-46 can be introduced into the reactor, so as to increase the throughputs.

13010 (UCRL-JC–114186) **A frictional work predictive method for the initiation of solid high explosives from low-pressure impacts.** Chidester, S.K.; Green, L.G.; Lee, C.G. Lawrence Livermore National Lab., CA (United States). Jul 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930713–29: 10. detonation symposium, Boston, MA (United States), 12-16 Jul 1993). Order Number DE94001531. Source: OSTI; NTIS; GPO Dep.

The goal of these tests was to provide information that would aid in the prediction of HE response in accident situations where the initiating stimulus was less than that required for direct shock initiation. Before these tests were run, a prediction of threshold impact velocity was made (70m/s) using a rough average of previously reported threshold factional work from skid tests (1 cal/cm_2) and the experimental value for coefficient of friction of 0.5(±) measured in the same tests for PBX-9404. The actual testing proved the threshold impact velocity to be much less, and the pretest prediction was not only wrong, it was not conservative. This work presents a methodology for more accurately predicting the reaction threshold for HE involved in an accident such as an airplane crash or a severe land transportation accident. The main focus of this work is on LX-10-1 (94.5% 5.5% Viton A binder, density 1.86g/cm^3). Additional work was done on LX-17 (92.5% TATB, 7.5% KelF binder, density 1.90g/cm_3), a very insensitive explosive. The explicit two-dimensional finite element code, DYNA2D, was used to model the tests and predict the HE response. The finite element mesh of the projectile and target were generated using MAZE. The post-processing of the DYNA2D analysis was done with ORION.

4502 Nuclear Explosions and Explosives

Refer also to citation(s) 12323, 12466, 13002, 13005, 13038, 13800

13011 (LA-UR–94-0153) **Source and replica calculations.** Whalen, P.P. Los Alamos National Lab., NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940424–18: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94006274. Source: OSTI; NTIS; INIS; GPO Dep.

The starting point of the Hiroshima-Nagasaki Dose Reevaluation Program is the energy and directional distributions of the prompt neutron and gamma-ray radiation emitted from the exploding bombs. A brief introduction to the neutron source calculations is presented. The development of our current understanding of the source problem is outlined. It is recommended that adjoint calculations be used to modify source spectra to resolve the neutron discrepancy problem.

13012 (SAND–93-1085) **Packaging design guide of the Packaging Advisory Board: A broad range of lessons learned in the design of weapon systems.** Dunn, P.A. (Ewing Technical Design, Inc., Albuquerque, NM (United States)); Williams, T.J.; Sayre, J.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007025. Source: OSTI; NTIS; GPO Dep.

This design guide was written for the design engineers at Sandia National Laboratories and related companies. It is a brief presentation of the lessons that have been learned about the packaging of components, modules, and assemblies into nuclear weapon systems, The major topics are high voltage containment, the encapsulation of electronic assemblies, management of thermal stress in encapsulated assemblies, and a wide variety of materials issues. The Packaging Advisory Board performs packaging reviews upon request. They offer advice that is based on their depth of packaging experience, which stretches back to the early 1970s.

13013 (SAND–93-1571) **Autosim user guide.** Baker, E.D. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007026. Source: OSTI; NTIS; GPO Dep.

Autosim is a software package written to control and trigger the programmable instruments that are used to supply simulated signals to the recording devices on underground nuclear weapons effects tests at the Nevada Test Site. These instruments are located either in the tunnel or at a remote site, and may be controlled from anywhere on the Department 9320 Computer Network. Autosim incorporates commands to control the operation of the Laser Calibrator that is a fiber optic device that transmits a signal from down-hole to the uphole recorders. Autosim also supports the task of characterizing the cable links by communicating to some high bandwidth digitizers that are used to input the pulse of the downhole simulator. To minimize the learning interval, Autosim utilizes menus and offers on-line help on most of the selections in the menu options.

13014 (SAND–93-1912C) **Cable discharge system for fundamental detonator studies.** Peevy, G.R.; Barnhart, S.G.; Brigham, W.P. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940245–3: 1994 National Aeronautics and Space Administration pyrotechnic systems workshop, Albuquerque, NM (United States), 8-9 Feb 1994). Order Number DE94006356. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Sandia National Laboratories has recently completed the modification and installation of a cable discharge system (CDS) which will be used to study the physics of exploding bridgewire (EBW) detonators and exploding foil initiators (EFI or slapper). Of primary interest are the burst characteristics of these devices when subjected to the constant current pulse delivered by this system. The burst process involves the heating of the bridge material to a conductive plasma and is essential in describing the electrical properties of the bridgewire foil for use in diagnostics or computer models. The CDS described herein is capable of delivering up to an 8000 A pulse of 3 μs duration. Experiments conducted with the CDS to characterize the EBW and EFI burst behavior are also described. In addition, the CDS simultaneous VISAR capability pemits updating the EFI electrical Gurney analysis parameters used in our computer simulation codes. Examples of CDS generated data for a typical EFI and EBW detonator are provided.

13015 (SAND–93-2291) **Impact analysis of Minuteman III Payload Transporter Type III.** Stirbis, P.P. Sandia National Labs., Albuquerque, NM (United States). Dec 1993. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94005075. Source: OSTI; NTIS; GPO Dep.

An analysis of the impact of the Minuteman III Payload Transporter Type III into a nonyielding target at 46 m.p.h. and 30 m.p.h., and into a yielding target at 46 m.p.h. is presented. The analysis considers the structural response of the tiedown system which secures the Minuteman III re-entry system to the floor of the payload transporter. A finite element model of the re-entry system, its tiedown system, which includes tie-rods and shear pins, and the pallet plate which is attached to the transporter floating plate, was constructed. Because accelerations of the payload transporter are not known, acceleration data from one-quarter scale testing of the Safe Secure Trailer was used to investigate the response of the tiedown system. These accelerations were applied to the pallet plate. The ABAQUS computer code was used to predict the forces in the members of the tiedown system.

13016 (SAND–93-3865C) **The relative performance of FeS_2 and CoS_2 in long-life thermal-battery applications.** Guidotti, R.A.; Reinhardt, F.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940529–2: 185. Electrochemical Society meeting, San Francisco, CA (United States), 22-27 May 1994). Order Number DE94006145. Source: OSTI; NTIS; GPO Dep.

The relative performance of FeS_2 and CoS_2 was measured in single cells based on the LiBr-KBr-LiF 0 eutectic electrolyte over a temperature range of 400° to 550°C using both standard (dry) and flooded anodes. This electrolyte is designed to be used in long-life (>I h) thermal-battery applications because it has a lower melting point (313°C) and a higher electrical conductivity than the standard LiCl-KCl eutectic (m.p.= 352°C). The cells were continuously pulsed for 1 ms every 10 ms from a background current density of 190 mA/sq cm to 1,130 mA/sq cm until end of life.

13017 (UCRL–52000-93-11/12) **Energy & technology review, November–December 1993.** Quirk, W.J.; Canada, J.; de Vore, L.; Gleason, K.; Kirvel, R.D.; Kroopnick, H.; McElroy, L. (eds.). Lawrence Livermore National Lab., CA (United States). Nov 1993. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007256. Source: OSTI; NTIS; GPO Dep.

For the 40-plus years of the Cold War, both the United States and the Soviet Union built up nuclear stockpiles of tens of thousands of weapons. Now, as the Cold War has ended and tensions between the superpowers have subsided, the US faces the task of significantly reducing its nuclear arsenal. Many thousands of nuclear weapons are being removed from the stockpile as a result of recent treaties and unilateral decisions. This issue of Energy and Technology Review describes the Laboratory's role in the nation's effort to dismantle these weapons safely and rapidly. The dismantlement of the United States' nuclear weapons takes place at the Department of Energy's Pantex facility near Amarillo, Texas. The first article in this issue summarizes the Laboratory's involvement in dismantling Livermore-designed nuclear weapons. LLNL (like Los Alamos) has responsibility for the weapons it designed, from design concept to retirement. In the past, the responsibilities ended when the weapon was retired from the stockpile. Now however, the role has been extended to include dismantlement. The second article reports on an incident that occurred in November 1992, in which the pit of a W48 warhead cracked during dismantlement. The Laboratory was called upon to handle the pit safely and determine the causes of the cracking. The third article explores a variety of methods proposed for reusing the high explosives after they are removed from the weapon. In the past, Laboratory work on nuclear weapons focused primarily on design and development. However, as the size and composition of the US stockpile changes with evolving international conditions, they will be called upon with increasing frequency to provide the scientific and technical expertise needed to dismantle the nation's retired nuclear weapons safely and efficiently.

13018 (UCRL-ID–115845) **Identification and evaluation of the nonradioactive toxic components in LLNL weapon designs, Phase 1.** Johnson, J.A.; Lipska-Quinn, A.E. Lawrence Livermore National Lab., CA (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008233. Source: OSTI; NTIS; GPO Dep.

The proper industrial hygiene strategy and response to a weapons accident is dependent upon the nonradioactive toxic materials contained in each weapon system. For example, in order to use the proper sampling and support equipment, e.g., personal protective and air sampling equipment, the Accident Response Group (ARG) Team needs a detailed inventory of nonradioactive toxic and potentially toxic materials in the weapon systems. The DOE Albuquerque Office or Operations funded the Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL) and Sandia National Laboratory to identify and evaluate the

nonradioactive toxic components of their respective weapons designs. This report summarizes LLNL's first year's activities and results.

13019 (UCRL-JC–114681) **Secondary wastes and high explosive residues generated during production of main high explosive charges for nuclear weapons.** Jardine, L.J.; McGee, J.T. Lawrence Livermore National Lab., CA (United States). Feb 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940225–66: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007931. Source: OSTI; NTIS; GPO Dep.

This study identifies the sources of high-explosive (HE) residues and hazardous and nonhazardous wastes generated during the production of the main HE charges for nuclear weapons, and estimates their quantities and characteristics. The results can be used as a basis for design of future handling and treatment systems for solid and liquid HE residues and wastes at any proposed new HE production facilities. This paper outlines a general methodology for documenting and estimating the volumes and characteristics of the solid and liquid HE residues and hazardous and nonhazardous wastes. We prepared volume estimates by applying this method to actual past Pantex plant HE production operations. To facilitate the estimating, we separated the HE main-charge production process into ten discrete unit operations and four support operations, and identified the corresponding solid and liquid HE residues and waste quantities. Four different annual HE main-charge production rates of 100, 500, 1000, and 2000 HE units/yr were assumed to develop the volume estimates and to establish the sensitivity of the estimates to HE production rates. The total solids (HE residues and hazardous and nonhazardous wastes) estimated range from 800 to 2800 ft^3/yr and vary uniformly with the assumed HE production rate. The total liquids estimated range from 73,000 to 1,448,000 gal/yr and also vary uniformly with the assumed production rate.

4503 Nuclear Explosion Detection

Refer also to citation(s) 12472

13020 (SAND–94-0441C) **Portable, solid state, fiber optic coupled Doppler interferometer system for detonation and shock diagnostics.** Fleming, K.J.; Crump, O.B. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940245–5: 1994 National Aeronautics and Space Administration pyrotechnic systems workshop, Albuquerque, NM (United States), 8-9 Feb 1994). Order Number DE94007375. Source: OSTI; NTIS; GPO Dep.

VISAR (Velocity Interferometer System for Any Reflector) is a specialized Doppler interferometer system that is gaining worldwide acceptance as the standard for shock phenomena analysis. The VISAR's large power and cooling requirements, and the sensitive and complex nature of the interferometer cavity have restricted the traditional system to the laboratory. This paper describes the new portable VISAR, its peripheral sensors, and the role it played in optically measuring ground shock of an underground nuclear detonation. The solid State VISAR uses a prototype diode pumped ND:YAG laser and solid state detectors that provide a suitcase-size system with low power requirements. A special window and sensors were developed for fiber optic coupling (1 kilometer long) to the VISAR. The system has proven itself as a reliable, easy to use instrument that is capable of field test use and rapid data reduction using only a notebook personal computer (PC).

13021 (UCRL-ID–115729) **Seismic wave propagation through a low-velocity nuclear rubble zone.** Larsen, S.; Harris, D. Lawrence Livermore National Lab., CA (United States). Oct 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007764. Source: OSTI; NTIS; GPO Dep.

A 2-dimensional finite-difference code has been developed as part of the Hydroacoustic Nuclear Proliferation Monitoring Project (ST639). This code is used to model seismic and acoustic wave propagation in the Earth's crust and oceanic water column. As a demonstration, we investigate the propagation of seismic energy through a low-velocity region corresponding to the rubble zone created by an underground nuclear explosion. The geometry of the simulated source and surface recording instruments is representative of a seismic refraction survey. The purpose of this numerical simulation is to determine perturbations in the seismic wave field due to the low velocity region (nuclear cavity) can be detected at the surface. Wave energy passing through the cavity is noticeably delayed, and is easily observed on cross-sections of the P and S wave fields. Synthetic seismograms recorded at the surface demonstrate an amplitude reduction and phase shift for those stations corresponding to ray-paths through the cavity. A significant fraction of energy is reflected off the low-velocity zone, and propagates as backward traveling waves.

4504 Nuclear and Radiological Warfare

Refer also to citation(s) 12328

13022 (CONF-940424–19) **Application of the MASH v1.0 Code System to radiological warfare radiation threats.** Johnson, J.O.; Santoro, R.T.; Smith, M.S. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994. Order Number DE94007215. Source: OSTI; NTIS; INIS; GPO Dep.

Nuclear hardening capabilities of US and foreign ground force systems is a primary concern of the Department of Defense (DoD) and US Army. The Monte Carlo Adjoint Shielding Code System – MASH v1.0 was developed at Oak Ridge National Laboratory (ORNL) to analyze these capabilities, i.e. the shielding effectiveness, for prompt radiation from a nuclear weapon detonation. Rapidly changing world events and the proliferation of nuclear weapons related technology have increased the kinds of nuclear threats to include intentionally dispersed radiation sources and fallout from tactical nuclear weapons used in the modern AirLand battlefield scenario. Consequently, a DoD area of increasing interest focuses on determining the shielding effectiveness of foreign and US armored vehicles to radiological warfare and fallout radiation threats. To demonstrate the applicability of MASH for analyzing dispersed radiation source problems, calculations have been completed for two distributed sources; a dispersed radiation environment simulated by a uniformly distributed ^{60}Co source, and a ^{235}U fission weapon fallout source. Fluence and dose assessments were performed for the free-field, the inside of a steel-walled two-meter box, in a phantom standing in the free-field, and in a phantom standing in the two-meter box. The results indicate substantial radiation protection factors for the ^{60}Co dispersed radiation source and the fallout source compared to the prompt radiation protection factors. The dose protection factors ranged from 40 to 95 for the two-meter box and from 55 to 123 for the mid-gut position of the phantom standing in the box. The results further indicate that a ^{60}Co source might be a good first order approximation for a tactical fission weapon fallout protection factor analysis.

4505 Strategic Defense Initiative

13023 (CONF-940424–16) **Vulnerability assessment of a space based weapon platform electronic system exposed to a thermonuclear weapon detonation.** Perez, C.L. (North Carolina Univ., Chapel Hill, NC (United States). Dept. of Mathematics); Johnson, J.O. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994. Order Number DE94007229. Source: OSTI; NTIS; GPO Dep.

Rapidly changing world events, the increased number of nations with inter-continental ballistic missile capability, and the proliferation of nuclear weapon technology will increase the number of nuclear threats facing the world today. Monitoring these nation's activities and providing an early warning and/or intercept system via reconnaissance and surveillance satellites and space based weapon platforms is a viable deterrent against a surprise nuclear attack.

However, the deployment of satellite and weapon platform assets in space will subject the sensitive electronic equipment to a variety of natural and man-made radiation environments. These include Van Allen Belt protons and electrons; galactic and solar flare protons; and, neutrons, gamma rays, and X-rays from intentionally detonated fission and fusion weapons. In this paper, the MASH vl.0 code system is used to estimate the dose to the critical electronics components of an idealized space based weapon platform from neutron and gamma-ray radiation emitted from a thermonuclear weapon detonation in space. Fluence and dose assessments were performed for the platform fully loaded, and in several stages representing limited engagement scenarios. The results indicate vulnerabilities to the Command, Control, and Communication (C) bay instruments from radiation damage for a nuclear weapon detonation for certain source/platform orientations. The distance at which damage occurs will depend on the weapon yield (n,γ/kiloton) and size (kilotons).

13024 (SAND–94-0139) **A model for forming airborne synthetic aperture radar images of underground targets.** Doerry, A.W. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007252. Source: OSTI; NTIS; GPO Dep.

Synthetic Aperture Radar (SAR) from an airborne platform has been proposed for imaging targets beneath the earth's surface. The propagation of the radar's energy within the ground, however, is much different than in the earth's atmosphere. The result is signal refraction, echo delay, propagation losses, dispersion, and volumetric scattering. These all combine to make SAR image formation from an airborne platform much more challenging than a surface imaging counterpart. This report treats the ground as a lossy dispersive half-space, and presents a model for the radar echo based on measurable parameters. The model is then used to explore various imaging schemes, and image properties. Dynamic range is discussed, as is the impact of loss on dynamic range. Modified window functions are proposed to mitigate effects of sidelobes of shallow targets overwhelming deeper targets.

4506 Chemical and Biological

13025 (PNL–8370) **Integrated Baseline System (IBS) Version 1.03: Utilities guide.** Burford, M.J.; Downing, T.R.; Pottier, M.C.; Schrank, E.E.; Williams, J.R. Pacific Northwest Lab., Richland, WA (United States). Jan 1993. 407p. Sponsored by Federal Emergency Management Agency, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94008648. Source: OSTI; NTIS; GPO Dep.

The Integrated Baseline System (IBS) is an emergency management planning and analysis tool that was developed under the direction of the Federal Emergency Management Agency (FEMA). This Utilities Guide explains how to operate utility programs that are supplied as a part of the IBS. These utility programs are chiefly for managing and manipulating various kinds of IBS data and system administration files. Many of the utilities are for creating, editing, converting, or displaying map data and other data that are related to geographic location.

13026 (PNL–8383) **Integrated Baseline System (IBS) Version 1.03: Models guide.** Pacific Northwest Lab., Richland, WA (United States). Jan 1993. 273p. Sponsored by Federal Emergency Management Agency, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94008649. Source: OSTI; NTIS; GPO Dep.

The Integrated Baseline System)(IBS), operated by the Federal Emergency Management Agency (FEMA), is a system of computerized tools for emergency planning and analysis. This document is the models guide for the IBS and explains how to use the emergency related computer models. This document provides information for the experienced system user, and is the primary reference for the computer modeling software supplied with the system. It is designed for emergency managers and planners, and others familiar with the concepts of computer modeling. Although the IBS manual set covers basic and advanced operations, it is not a complete reference document set. Emergency situation modeling software in the IBS is supported by additional technical documents. Some of the other IBS software is commercial software for which more complete documentation is available. The IBS manuals reference such documentation where necessary.

54 ENVIRONMENTAL SCIENCES

Refer also to citation(s) 12637, 12749

13027 (KFK–5159) **2nd meeting of the WG 'Tools for simulation and modelling in environmental applications'.** Keller, H.B. (ed.) (Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Angewandte Informatik); Gruetzner, R. (ed.). Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Angewandte Informatik; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Schadstoff- und Abfallarme Verfahren (PSA). Mar 1993. 81p. (In German). (CONF-9211294–Exc.: 2. meeting of the working group tools for simulation and modelling in environmental applications of the computer science for environmental protection of the Society for Computer Science, Karlsruhe (Germany), 5-6 Nov 1992). Order Number DE94752368. Source: OSTI; NTIS (US Sales Only).

This report contains the papers of the 2nd meeting of the working group 'Tools for Simulation and Modelling in Environmental Applications', of the section 4.6, 'Computer Science for Environmental Protection', of the Society for Computer Science (GI), which took place at Karlsruhe on 5th-6th of november in 1992. (orig.)

13028 (LA-UR–94-52) **Distributions of 14 elements into 10 liquid extractants from simulated acid-dissolved sludge and acidified supernate solutions of Hanford high-level waste.** Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940225–5: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006226. Source: OSTI; NTIS; INIS; GPO Dep.

The distributions of 14 elements into ten extractants were measured from simulant solutions that represent acidic dissolved sludge and acidified supernate from Hanford HLW Tank 102-SY. The extractants: LIX™-26, LIX™-54, LIX™-84, LIX™-1010, Cyanex™ 272, Cyanex™ 923, Aliquat™ 336, DHDECMP, DHDECMP-DIPB, and CMPO-DIPB, were sorbed on porous carbon beads to provide dry-appearing beads that would be suitable for column operations. The selected elements, which represent fission products: Ce, Cs, Sr, Tc, and Y; actinides: U, Pu, and Am; and matrix elements: Cr, Co, Fe, Mn, Zn, and Zr; were traced by radionuclides and measured by gamma spectrometry. Distribution coefficients for each of 280 element/absorber/solution combinations were measured for dynamic contact periods of 30 minutes, 2 hours, and 6 hours to provide sorption kinetics information for the selected elements from these complex media. The resulting 840 measured distribution coefficients are presented.

13029 (PNL–9016) **Laboratory Directed Research and Development annual report, Fiscal year 1993.** Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94006736. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy Order DOE 5000.4A establishes DOE's policy and guidelines regarding Laboratory Directed Research and Development (LDRD) at its multiprogram laboratories. As described in 5000.4A, LDRD is "research and development of a creative and innovative nature which is selected by the Laboratory Director or his or her designee, for the purpose of maintaining the scientific and technological vitality of the Laboratory and to respond to scientific and technological opportunities in conformance with the guidelines in this Order. LDRD includes activities previously defined as ER&D, as well as other discretionary research and development activities not provided for in a DOE program." Consistent with the Mission Statement and Strategic Plan provided in PNL's Institutional Plan, the LDRD investments are focused on developing new and innovative approaches in research related to our

"core competencies." Currently, PNL's core competencies have been identified as integrated environmental research; process technology; energy systems research. In this report, the individual summaries of Laboratory-level LDRD projects are organized according to these core competencies. The largest proportion of Laboratory-level LDRD funds is allocated to the core competency of integrated environmental research. A significant proportion of PNL's LDRD funds are also allocated to projects within the various research centers that are proposed by individual researchers or small research teams. The projects are described in Section 2.0. The projects described in this report represent PNL's investment in its future and are vital to maintaining the ability to develop creative solutions for the scientific and technical challenges faced by DOE and the nation. In accordance with DOE guidelines, the report provides an overview of PNL's LDRD program and the management process used for the program and project summaries for each LDRD project.

13030 (SAND–93-3967C) **Information systems to enhance technology exchange.** Hunter, T. (Sandia National Labs., Albuquerque, NM (United States)); Harrington, M.; Harlan, C.; Drozhko, E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940225–52: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94007744. Source: OSTI; NTIS; GPO Dep.

A fundamental part of international technology exchange is the compilation and dissemination of information. Worldwide environmental problems and technology development activities form the basis for important opportunities across the world and especially for those in the former Soviet Union. Recently, important agreements have been reached among Russian institutes engaged in environmental work and the US Department of Energy (DOE) and its national laboratories. These agreements will allow a systematic compilation of information on environmental contamination problems in Russia that can be included in DOE's environmental information systems. A computer hardware and software system has been loaned to Russian scientists by the DOE for the sharing of environmental software and data, while establishing standards for future information networks.

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 11464, 11499, 11502, 11523, 11524, 11525, 11528, 11695, 11732, 11809, 11913, 11914, 12105, 12106, 12192, 12412, 12419, 12422, 12618, 12686, 12704, 12718, 12808, 12924, 13009, 13011, 13095, 13107, 13130, 13225, 13318, 13328, 13330, 13339

13031 (ANL/ES/CP–82079) **Greenhouse gas emission impacts of electric vehicles under varying driving cycles in various counties and US cities.** Wang, M.Q.; Marr, W.W. Argonne National Lab., IL (United States). 10 Feb 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940422–1: 5. global warming science and policy international conference and expo, San Francisco, CA (United States), 4-7 Apr 1994). Order Number DE94007647. Source: OSTI; NTIS; INIS; GPO Dep.

Electric vehicles (EVs) can reduce greenhouse gas emissions, relative to emissions from gasoline-fueled vehicles. However, those studies have not considered all aspects that determine greenhouse gas emissions from both gasoline vehicles (GVs) and EVs. Aspects often overlooked include variations in vehicle trip characteristics, inclusion of all greenhouse gases, and vehicle total fuel cycle. In this paper, we estimate greenhouse gas emission reductions for EVs, including these important aspects. We select four US cities (Boston, Chicago, Los Angeles, and Washington, D.C.) and six countries (Australia, France, Japan, Norway, the United Kingdom, and the United States) and analyze greenhouse emission impacts of EVs in each city or country. We also select six driving cycles developed around the world (i.e., the US federal urban driving cycle, the Economic Community of Europe cycle 15, the Japanese 10-mode cycle, the Los Angeles 92 cycle, the New York City cycle, and the Sydney cycle). Note that we have not analyzed EVs in high-speed driving (e.g., highway driving), where the results would be less favorable to EVs; here, EVs are regarded as urban vehicles only. We choose one specific driving cycle for a given city or country and estimate the energy consumption of four-passenger compact electric and gasoline cars in the given city or country. Finally, we estimate total fuel cycle greenhouse gas emissions of both GVs and EVs by accounting for emissions from primary energy recovery, transportation, and processing; energy product transportation; and powerplant and vehicle operations.

13032 (ANL/ET/RP–81971) **Capture of green-house carbon dioxide in Portland cement.** Wagh, A.S.; Singh, D.; Pullockaran, J.; Knox, L. Argonne National Lab., IL (United States). [1993]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94006821. Source: OSTI; NTIS; GPO Dep.

A novel process has been developed to sequester green-house carbon dioxide produced by the cement industry in precast cement products. Typically, 10–24 wt % of CO_2 produced by calcination of calcium carbonate during clinkering of the cement may be captured. The carbonation process also cures the cement paste within minutes into hard bodies. The process maintains high pH conditions during curing, to allow conventional steel reinforcement of concrete. The process will save time and money to the cement industry, and at the same time, help them to comply with the Clean Air Act by sequestering the green-house carbon dioxide.

13033 (CEA-N–2741) **Massively parallel numerical model. Parallelization of climatic model of oceans of the earth.** Rouvillois, P. CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France). 1993. 37p. (In French). Order Number DE94618339. Source: OSTI; NTIS (US Sales Only); INIS.

This work consists in a development of models of performances of massively parallel programs and to make parallel a model of oceanic circulation. Here are reception team's projects and realized studies.

13034 (DOE/EH–0360) **Summary of radionuclide air emissions from Department of Energy facilities for CY 1992.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. Feb 1994. 46p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94006425. Source: OSTI; NTIS; INIS; GPO Dep.

DOE facilities submit annual reports to their respective EPA regional offices and to EPA headquarters describing their activities during the previous year, including estimates of atmospheric radionuclide emissions and the resulting dose to the maximally exposed member of the public. This report summarizes the information submitted to EPA by DOE facilities in their air emission reports for calendar year 1992. An overview of DOE facility compliance with the NESHAPs Subpart H dose standard is provided. In addition to the required compliance information, supplemental information on air emissions is discussed.

13035 (DOE/ER/61221–2) **Studies in regional climate sensitivity, predictability, and temporal response: Progress report, September 1992–February 1993.** Crowley, T.J.; North, G.R. Applied Research Corp., College Station, TX (United States). Feb 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER61221. Order Number DE94008450. Source: OSTI; NTIS; GPO Dep.

The main theme of this research project is to explore the behavior of a class of climate models by use of classical statistical estimation techniques and to examine the broader applicability of the techniques themselves. In particular, the authors study a class of energy balance climate models including a crude representation of the deep ocean and with stochastic forcing at the surface. These models include an explicit representation of the land-sea geography so that regional products are generated (although crude at best). The authors view the exercise as preliminary to the same techniques being applied to coupled ocean/atmosphere general circulation models and the solutions they generate can be thought of as benchmarks against which the more detailed simulations can be compared.

13036 (DOE/ER/61552–1) **ACP research and scientific coordination: Annual performance report.** Hales, J.M. Envair, Kennewick, WA (United States). 17 Sep 1992. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-93ER61552. Order Number DE94008265. Source: OSTI; NTIS; GPO Dep.

This research grant addresses two primary objectives: 1. Conduct of specific research tasks under the DOE Atmospheric Chemistry Program (ACP), and 2. Provision of scientific coordination for the Atmospheric Chemistry Program. In summary, the project is progressing essentially as expected, with some minor exceptions. Higher than anticipated demands within Objective 2, associated primarily with the ACP Ozone Project and the recompetition of the National Laboratories protion of ACP, have resulted in a somewhat higher proportionate emphasis on the coordination activities associated with this objective. Also, the immediate need for pre-campaign modeling of the North Pacific has resulted in an acceleration of the Pacific modeling task relative to other tasks, particularly the Atlantic modeling task. Modeling activities in general have been delayed somewhat because of the noted Objective 2 demands and because of the extended time that was necessary to complete financial agreements for this grant.

13037 (DOE/NV/10845–27) **Remote sensing for the geobotanical and biogeochemical assessment of environmental contamination.** Wickham, J.; Chesley, M.; Lancaster, J.; Mouat, D. Nevada Univ., Reno, NV (United States). Desert Research Inst. Jan 1993. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE94003951. Source: OSTI; NTIS; INIS; GPO Dep.

Publication No. 45111.

Under Contract Number DE-AC08-90NV10845, the DOE has funded the Desert Research Institute (DRI) to examine several aspects of remote sensing, specifically with respect to how its use might help support Environmental Restoration and Waste Management (ERWM) activities at DOE sites located throughout the country. This report represents partial fulfillment of DRI's obligations under that contract and includes a review of relevant literature associated with remote sensing studies and our evaluation and recommendation as to the applicability of various remote sensing techniques for DOE needs. With respect to DOE ERWM activities, remote sensing may be broadly defined as collecting information about a target without actually being in physical contact with the object. As the common platforms for remote sensing observations are aircraft and satellites, there exists the possibility to rapidly and efficiently collect information over DOE sites that would allow for the identification and monitoring of contamination related to present and past activities. As DOE sites cover areas ranging from tens to hundreds of square miles, remote sensing may provide an effective, efficient, and economical method in support of ERWM activities. For this review, remote sensing has been limited to methods that employ electromagnetic (EM) energy as the means of detecting and measuring target characteristics.

13038 (DOE/NV/11432–10) **Operational air sampling report: [Semiannual report], January 1–June 30, 1993.** Lyons, C.L. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Dec 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE94004718. Source: OSTI; NTIS; GPO Dep.

Nevada Test Site vertical shaft and tunnel events generate beta/gamma fission products. This report discusses the REECo air sampling program which is designed to measure these radionuclides at various facilities supporting these events. The current testing moratorium and closure of the Decontamination Facility has decreased the scope of the program significantly. Of the 243 air samples collected in the only active tunnel complex, none showed any airborne fission products. Tritiated water vapor concentrations were very similar to previously reported levels. The 246 air samples collected at the Area-6 decontamination bays and laundry were again well below any Derived Air Concentration calculation standard. Laboratory analyses of these samples were negative for any airborne fission products.

13039 (ENEA-RT-NUCL–92-24, pp. 9-13) **Assessment on fusion radioactive waste environmental impact with reference to thermal power plants.** Donato, A. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Petrizzi, L. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The radioactive waste Ingestion Toxic Potential IT for neutron activation produced radionuclides (Starfire conditions) was calculated up to 10^6 year's decay time for several LAM (Low Activation Materials) materials assumed to be potentially used in a fusion reactor. The results were compared with the IT calculated for toxic heavy metals contained in the burnt coal or fuel oil of thermal power plants. The use of LAM gives a lower waste environmental impact than coal power plants and, after 2-5 years' decay time, than fuel oil thermal power plants.

13040 (INIS-BR–3239) **Periods of high intensity rainfall and the safety of the Angra dos Reis nuclear power plant.** Nicolli, D. (Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil)). Associacao Brasileira de Recursos Hidricos, Rio de Janeiro, RJ (Brazil). 1993. 10p. (In Portuguese). (CONF-9311174–: 10. Brazilian Symposium on Hydric Resources; 1. Symposium on Hydric Resources of Cone Sul, Gramado (Brazil), 7-12 Nov 1993). Order Number DE94615861. Source: OSTI; NTIS (US Sales Only); INIS.

The high precipitation rates aggravate the consequences of hypothetical accidental releases of radioactive material from the Angra dos Reis Nuclear Power Plant (NPP), as determined by probabilistic risk assessment. A 30-year rainfall series was analysed, aiming at calculating the probability of occurring a given amount q of precipitation during a certain period of n days. The nine highest precipitation amounts have also been determined. The results show there was a rainier climate in the '50 s and '60 s than in the '70 s and '80 s. The risk of catastrophic landslide has been enhanced as an environmental impact of the construction of the Rio-Santos highway and NPP which have not yet gone through an abnormal rainfall period. It has been suggested that criteria should be established to reduce the nuclear power and shut down the reactor when the precipitation accumulates to a dangerous limit. (author).

13041 (ITF–93-11U) **Model of radioactive atmospheric contamination falling for local sources at ground.** Steshenko, A.J.; Avramenko, V.Yi. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 17p. (In Ukrainian). Order Number DE94615849. Source: OSTI; NTIS (US Sales Only); INIS.

Using the diffusion-transport equation we consider the problem of the atmospheric contamination migration. Definite investigations for volume activity of air radionuclide admixtures, vertical fluxes and surface contamination concentration are performed in the case of local sources with a finite time of action. For the quantities considered we obtained the corresponding evolution maps of iso lines in order to forecast changes of radioecology state near the sources of radionuclide contamination. (author). 8 refs., 12 figs.

13042 (ITL/IS-JULK–6) **A model for evaporation of freely falling droplets.** Vesala, T. (Finnish Meteorological Inst., Helsinki (Finland)); Kukkonen, J.; Kulmala, M. Finnish Meteorological Inst., Helsinki (Finland). 1989. 59p. Order Number DE94722041. Source: OSTI; NTIS.

The results of theoretical investigations concerning the quasistationary evaporation of freely falling droplets in the continuum regime are presented. The mathematical model is based on simultaneous numerical solution of equations governing mass and heat transfer from the droplet surface. The model includes a description of forced convective mass and heat transfer due to free fall. It has been focused on estimating the effect of the competing evaporation and settling processes on the deposition of a population of monodisperse droplets. The model has been applied to predict the evolution of water and ammonia droplets in gas mixtures containing air and the vapour of evaporating species. The ambient conditions for the computations have been chosen to correspond to accidental releases of liquefied ammonia from pressurized containers. The numerical results show droplet size regimes where deposition or total evaporation take place in various conditions. The model computations give also predictions of the mass fraction of species deposited on the ground.

13043 (ITL/IS-JULK–8) **Weekly variations of sulphur dioxide and aerosol sulphate concentrations at Finnish background stations.** Parviainen, M.; Joffre, S.M. Finnish Meteorological Inst., Helsinki (Finland). 1991. 44p. Order Number DE94722043. Source: OSTI; NTIS.

The variability of sulphur dioxide and aerosol sulphate with the days of the week was investigated at three background EMEP monitoring stations in Finland. The occurrence of such variability for SO_2 would indicate influences from nearby anthropogenic activities which should diminish at weekends and increase at the beginning of the week. On the other hand, as a secondary product, aerosol sulphate should not be primarily subject to these influences. The possible influences were sought using as a parameter the relative departure of the value for each day of the week from its bulk average. Due to year-to-year differences, results are not straightforward. Nevertheless, it seems that some nearby influences can be detected, especially at Virolahti, but they are not statistically significant. This investigation should be continued by relating these departures to a wind direction classification in order to determine the sources of contamination.

13044 (Juel–2550) **Estimation of emission data in Europe as input for long range transport calculations.** Holzapfel, C. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 2 - Chemie der Belasteten Atmosphaere); Memmesheimer, M. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie 2 - Chemie der Belasteten Atmosphaere. Nov 1991. 68p. Order Number DE94752379. Source: OSTI; NTIS (US Sales Only).

For the 3D-Eulerian chemical transport model (CTM) of the troposphere developed and applied by the EURAD-project the aim of which is to investigate and forecast the tropospheric ozone formation and acid deposition in Europe an emission inventory has been established for SO_2, NO_2, and volatile organic compounds (VOC). SO_2, NO_2, and VOC emissions from the power plants in West Europe are calculated from available data on installed power, on sulphur content of fuel used, and from estimated emission factors using the available data on emission modes. For NO_2 and VOC also the long distance road traffic is considered. The roads are considered as straight lines between the cities, and the line emission or the traffic volume is assumed to be proportional to the population number of the connected cities. Biogenic VOC emission was estimated based on forest distribution. The emissions are calculated in each of the grid elements used by the EURAD model (80 by 80 km^2). The difference between these calculated emission data and the averaged annual emission data available on national level is distributed in the grid elements assuming that the residual emission is proportional to population density. Cities are considered as point sources the emissions of which are proportional to their population number. The rest of the total emission is distributed uniformly on the rural area taking in account the land distribtuion in each grid element. The comparison of this model with more sophisticated emission inventories available for some countries or regions shows the quality of the estimation for the countries where data are lacking. A simple estimate of the concentration of gaseous emitted pollutants as for example SO_2 is given using the emission data of these compounds on an European scale assuming that the chemical processes degrading these compounds can be parameterized by an exponential decay. (orig.)

13045 (Juel–2776) **Fourth field experiment on atmospheric dispersion around the isolated hill Sophienhoehe in September 1989: Methods - experiments - data bank.** Zeuner, G. (ed.); Heinemann, K. (ed.). Forschungszentrum Juelich GmbH (Germany). Abt. Sicherheit und Strahlenschutz. May 1993. 201p. Order Number DE94747335. Source: OSTI; NTIS (US Sales Only).

In order to establish a data bank for the validation of advanced dispersion models, comprehensive meteorological measurements and dispersion experiments in a complex terrain with a well measured topography were carried out. These investigations became possible in cooperation with several external groups and with the financial support of the 'Bundesminister fuer Umwelt, Naturschutz und Reaktorsicherheit'. In this report the methods, experiments and results (data bank) of the fourth field experiment are described. (orig.)

13046 (KFK–5183) **Suitability of infrared spectroscopy for remote sensing of tropospheric trace gases.** Wetzel, G. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Meteorologie und Klimaforschung; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Physik. Mar 1993. 111p. (In German). Order Number DE94747642. Source: OSTI; NTIS (US Sales Only).

As far as the spatial and time dependent distributions of climate relevant trace gases in the troposphere on a global level are concerned, only few data have been made available so far. Remote sensing of tropospheric trace gases by means of satellites or aircraft may contribute significantly to the improvement of current knowledge in this field. It is therefore the objective of the present study to investigate the efficiency of infrared spectroscopy for tropospheric trace gas measurement. (orig./BBR)

13047 (KFK-PEF–95) **8. annual report of the research program for 'air pollution prevention measures' and 1. annual report of the research program 'Environment and health': Summaries of the project management.** Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF); Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Umwelt und Gesundheit (PUG). Apr 1992. 101p. (In German). (CONF-9203245–: 8. annual report of the Research Program for Air Pollution Prevention Measures of Kernforschungszentrum Karlsruhe GmbH (KfK), Karlsruhe (Germany), 17-19 Mar 1992; KFK-PUG–5). Order Number DE94752389. Source: OSTI; NTIS (US Sales Only).

8th Annual Report of the research program for Air Pollution Prevention Measures and 1st Annual Report of the research program 'Environment and Health'. This report compiles the summarizing reviews of the program management. The full papers, to which the summaries refer, are published in KfK-PEF 94 (April 1992) and KfK-PUG 4 (April 1992). (orig.)

13048 (LA–12699) **Mexico City Air Quality Research Initiative: Volume 5, Strategic evaluation.** Los Alamos National Lab., NM (United States). Mar 1994. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008625. Source: OSTI; NTIS; GPO Dep.

Members of the Task HI (Strategic Evaluation) team were responsible for the development of a methodology to evaluate policies designed to alleviate air pollution in Mexico City. This methodology utilizes information from various reports that examined ways to reduce pollutant emissions, results from models that calculate the improvement in air quality due to a reduction in pollutant emissions, and the opinions of experts as to the requirements and trade-offs that are involved in developing a program to address the air pollution problem in Mexico City. The methodology combines these data to produce comparisons between different approaches to improving Mexico City's air quality. These comparisons take into account not only objective factors such as the air quality improvement or cost of the different approaches, but also subjective factors such as public acceptance or political attractiveness of the different approaches. The end result of the process is a ranking of the different approaches and, more importantly, the process provides insights into the implications of implementing a particular approach or policy.

13049 (LA-UR–93-4245) **Development of pollution reduction strategies for Mexico City: Estimating cost and ozone reduction effectiveness.** Thayer, G.R. (Los Alamos National Lab., NM (United States)); Hardie, R.W.; Barrera-Roldan, A. Los Alamos National Lab., NM (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311158–1: Air and Waste Management Association international speciality conference, Pittsburgh, PA (United States), 7-12 Nov 1993). Order Number DE94004991. Source: OSTI; NTIS; INIS; GPO Dep.

This reports on the collection and preparation of data (costs and air quality improvement) for the strategic evaluation portion of the Mexico City Air Quality Research Initiative (MARI). Reports written for the Mexico City government by various international organizations were used to identify proposed options along with estimates of cost and emission reductions. Information from appropriate options identified by SCAQMD for Southern California were also used in the analysis. A linear optimization method was used to select a

group of options or a strategy to be evaluated by decision analysis. However, the reduction of ozone levels is not a linear function of the reduction of hydrocarbon and NO_x emissions. Therefore, a more detailed analysis was required for ozone. An equation for a plane on an isopleth calculated with a trajectory model was obtained using two endpoints that bracket the expected total ozone precursor reductions plus the starting concentrations for hydrocarbons and NO_x. The relationship between ozone levels and the hydrocarbon and NO_x concentrations was assumed to lie on this plane. This relationship was used in the linear optimization program to select the options comprising a strategy.

13050 (LA-UR–93-4526) **Wind-speed measurements with a scanning elastic-backscatter lidar.** Buttler, W.T.; Eichinger, W.E. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States);Department of Transportation, Washington, DC (United States);New Mexico State Government, Santa Fe, NM (United States). DOE Contract W-7405-ENG-36. (CONF-940362–1: 21. American Meteorological Society conference on agricultural and forest meteorology, San Diego, CA (United States), 7-10 Mar 1994). Order Number DE94004974. Source: OSTI; NTIS; GPO Dep.

During the 1992 Summer Olympics, the Los Alamos National Laboratory (LANL) lidar team participated in the Barcelona Air Quality Initiative (BAQI). One of the main objectives of this experiment was the remote measurement of wind speeds around the city to verify wind speeds and directions predicted by the Nonhydrostatic Mesoscale Model (MEMO). Remote determination of wind velocities in the mixing layer is important for the verification and determination of critical input parameters of urban-pollution transport models. Most present elastic-backscatter-lidar wind-speed-measurement methods rely on data acquired over time periods between 5 to 10 minutes (Matsui, 1990) and 30 minutes to 1 hour (Schols, et al. 1992). Lidar can measure the spatial properties of the wind field over large volumes of space. This capability is an improvement over present methods, which rely on instruments attached to balloons that measure only those winds along the path the balloon travels. The material that follows describes the principles implicit in the measurement of winds with an elastic-backscatter lidar, as well as the maximum cross-correlation algorithm used to extract wind speeds from lidar data acquired during the Summer Olympics at Barcelona, Spain, in July 1992.

13051 (LA-UR–94-101) **High resolution properties of the marine atmospheric boundary layer.** Cooper, D.; Cottingame, W.; Eichinger, W.; Forman, P.; Lebeda, C.; Poling, D.; Thorton, R. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940368–1: 21. conference on agricultural and forest meteorology, Boston, MA (United States), Mar 1994). Order Number DE94006235. Source: OSTI; NTIS; GPO Dep.

Los Alamos National Laboratory (LANL) participated in the Central Equatorial Pacific Experiment (CEPEX) by fielding a water-vapor Raman lidar on board the Research Vessel Vickers. The lidar measured water vapor concentration from the surface to lower tropospheric altitudes in order to support the CEPEX goal of evaluating a hypothesis regarding feedback mechanisms for global circulation models. This report describes some of the features observed within the marine Atmospheric Boundary Layer (ABL) and the lower troposphere. Data was collected continuously 24 hours per day over the equatorial Pacific from March 8th to March 2 1st of 1993 while in route between Guadalcanal and Christmas Island (the transect was at approximately 2° south latitude). The lidar collected vertical transects of water vapor concentration up to 10 km during night operations and 4 km in the day. The vertical lidar profiles of water vapor were produced by summing the data over a period up to 600 seconds. The water-vapor Raman lidar measured the properties of the marine ABL as well as the lower and mid-troposphere. From the lidar water vapor profiles, "images" of water vapor concentration versus altitude and date or sea surface temperature will be produced along with other products such as latent heat fluxes. The Raman water vapor lidar data will be used to better understand the role of transport and exchange at the ocean-atmosphere interface and throughout the marine atmosphere.

13052 (LA-UR–94-229) **Performance of a new wind updating system for a prognostic meteorological model in the environs of Mexico City.** Williams, M.D. Los Alamos National Lab., NM (United States). [1993]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931251–1: IMP workshop, Mexico City (Mexico), Dec 1993). Order Number DE94006243. Source: OSTI; NTIS; GPO Dep.

Los Alamos National Laboratory and Institute Mexicano del Petroleo are completely a joint study of options for improving air quality in Mexico City. The US Department of Energy supported the efforts of the Los Alamos investigators, while PEMEX supported the efforts of the Mexican researchers. One of the first steps in the process was to develop an understanding of the existing air quality situation. In this context we have modified a three-dimensional, prognostic, higher order turbulence model for atmospheric circulation (HOTMAC) to treat domains which include an urbanized area. This sophisticated meteorological model is required because of the complexity of the terrain and the relative paucity of meteorological data. Mexico City lies at an elevation of approximately 7500 feet above sea level in a "U" shaped basin which opens to the north. The city occupies a major part of the southwest portion of the basin. Upper level winds are provided by rawinsondes at the airport, while low-level winds are measured at several sites within the city. Many of the sites have obstructed upwind fetches for a variety of directions. During the wintertime when the worst air quality episodes occur, the winds are frequently light, and out of the northeast at lower levels, while above 1000 meters above the surface they are usually from the southwest. This means the winds are light within the city, but significant slope winds develop which influence the behavior of the pollutants. Frequently, the winds in the basin change as a seabreeze penetrates the basin from the northeast. The seabreeze produces a much different wind regime after its arrival in the late afternoon or early evening. This makes it important to update the winds in a realistic fashion.

13053 (LA-UR–94-606) **Surface probes of porous toluene/water ices: Adsorption kinetics and annealing spectra measured by second harmonic generation.** Henson, B.F.; Robinson, J.M. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940114–3: International symposium on optoelectronic and microwave engineering, Los Angeles, CA (United States), 22-28 Jan 1994). Order Number DE94007564. Source: OSTI; NTIS; GPO Dep.

We have applied the technique of second harmonic generation to the study of the solid/vapor interface of porous toluene/water ice films at low temperature. The ice samples are condensed from the vapor onto a cold support at 90K and are typically $\sim 500\mu m$ thick with an internal surface area of approximately $200m^2$. The ices are transparent to both the 532nm probe laser and to the 266nm second harmonic signal. Second harmonic light is generated from surfaces throughout the bulk of the porous sample. Significant differences in the efficiency for second harmonic generation from water and toluene enable the species specific study of annealing and adsorption in this binary system. Measurements of the coverage dependent adsorption of toluene on water ice, and the observation of a coverage dependent liquid-solid phase transition in a few monolayers of toluene adsorbed on water ice at temperatures below the bulk toluene melting temperature are presented.

13054 (NEI-FI–215) **Greenhouse gas emissions in Finland 1988 and 1990: Energy, industrial and transport activities.** Bostroem, S. (Insinoeoeritoimisto Prosessikemia Ky, Turku (Finland)); Backman, R.; Hupa, M. Insinoeoeritoimisto Prosessikemia Ky, Turku (Finland). 1992. 62p. Order Number DE94722022. Source: OSTI; NTIS.

The study if a part of the national inventory of greenhouse gas emissions and sinks in Finland. This report deals with greenhouse gas emissions related to energy production and consumption and other major activities in the industry and transport sectors in Finland. The report presents an estimate of the 1988 and 1990 emissions of the three most important greenhouse gases related to energy activities, i.e., CO_2, CH_4 and NO. The emissions of NO_x,

CO and NMVOCs are also estimated. The emission sources covered are combustion of fuels; non-combustion energy activities; non-energy activities in industry; non-energy activities in the transport sector; and some other non-energy activities.

13055 (NEI-NO–386) **Atmospheric trace element deposition in Norway studied by ICP-MS.** Berg, T. Trondheim Univ. (Norway). Oct 1993. 164p. Order Number DE94743505. Source: OSTI; NTIS.

This thesis presents data for 34 elements (Li, Be, B, Na, Mg, Al, Cl, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Rb, Sr, Y, Mo, Cd, Sb, Te, Cs, Ba, La, Hg, Tl, Pb, Bi, Th, U) in atmospheric deposition from remote and rural sites in Norway. The data are based on analyses of precipitation and moss used as biomonitor of atmospheric deposition. The present data set is the most extensive so far reported for trace element deposition in Norway, and probably also on an international level. By means of principal component analysis and enrichment factors (in the case of precipitation), the following sources have been found to be important with respect to trace elements in atmospheric deposition in Norway: Long-range atmospheric transport of anthropogenic elements from other parts of Europe; Local point sources of air pollution within or closely outside Norwegian borders; Crustal sources; Atmospheric transport from the marine environment. The highest concentrations of elements associated with anthropogenic activities occur in northeastern Norway (Co, Ni, Cu) and in the southern part of the country (V, Cu, Zn, As, Mo, Cd, Sb, Pb, Bi). This is attributed to industrial activities at the Kola peninsula, Russia, and to long-range atmospheric transport from more densely populated and heavily industrialized regions in Europe. Most of the time the concentration levels in precipitation are relatively low at Norwegian background stations. During periods with special meteorological situations, very high concentrations of long-range transported elements may be seen. Usually these are anthropogenic derived elements from other parts of Europe, but the present study indicates that Sahara dust also may reach Norway. 106 refs.

13056 (NEI-NO–390) **Snow and glacier ice characteristics measured using Landsat TM data.** Winther, J.G. Trondheim Univ. (Norway). Norges Tekniske Hoegskole. Sep 1993. 159p. Order Number DE94743509. Source: OSTI; NTIS.

The main objective of this thesis has been to study snow and glacier ice surface characteristics measured using Landsat Thematic Mapper (TM) satellite data. Relevant background such as the principles of remote sensing, characteristics of the Landsat TM satellite, radiative interactions in the atmosphere and at the surface, and factors that affect the visible and infra-red properties of snow are reviewed from existing literature. Methods for converting the Landsat TM image to surface reflectance, digital image processing techniques, and in situ measurements are also discussed. Four separate papers make up the basis of the thesis. The first paper is a basic study of snow reflectance, and serves as a base for the three following papers. They mainly focus on analyses of Landsat TM derived surface reflectance. In conclusion, the Landsat TM satellite has proved to be a very useful instrument for snow and glacier ice research. At spring snow conditions like they appeared at Kvikne, Norway, the satellite-registered data may easily underestimate the snow coverage. Even so, underestimation is avoided by utilizing the strong possibilities lying in multispectral image analyses. Further, the studies at Helligdagshaugen, Norway, and in Svalbard point out that the albedo of snow can vary considerably and is influenced by variables such as snow depth, solar elevation, cloud conditions, and bidirectional reflectance. 102 refs., 21 figs., 11 tabs.

13057 (ORNL/TM–12633) **Potential effects of clean coal technologies on acid precipitation, greenhouse gases, and solid waste disposal.** Blasing, T.J.; Miller, R.L.; McCold, L.N. Oak Ridge National Lab., TN (United States). Nov 1993. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007316. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's (DOE's) Clean Coal Technology Demonstration Program (CCTDP) was initially funded by Congress to demonstrate more efficient, economically feasible, and environmentally acceptable coal technologies. Although the environmental focus at first was on sulfur dioxide (SO_2) and nitrogen oxides (NO_x) because their relationship to acid precipitation, the CCTDP may also lead to reductions in carbon dioxide (CO_2) emissions and in the volume of solid waste produced, compared with conventional technologies. The environmental effects of clean coal technologies (CCTs) depend upon which (if any) specific technologies eventually achieve high acceptance in the marketplace. In general, the repowering technologies and a small group of retrofit technologies show the most promise for reducing $C0_2$ emissions and solid waste. These technologies also compare favorably with other CCTs in terms of SO_2 and NO_x reductions. The upper bound for CO^2 reductions in the year 2010 is only enough to reduce global "greenhouse" warming potential by about 1%. However, CO_2 emissions come from such variety of sources around the globe that no single technological innovation or national policy change could realistically be expected to reduce these emissions by more than a few percent. Particular CCTs can lead to either increases or decreases in the amount of solid waste produced. However, even if decreases are not achieved, much of the solid waste from clean coal technologies would be dry and therefore easier to dispose of than scrubber sludge.

13058 (PNL-SA–23229) **Water vapor from sunradiometry in comparison with microwave and balloon-sonde measurements at the Southern Great Plains ARM Site.** Michalsky, J.J. (State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center); Harrison, L.C.; Liljegren, J.C. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 5p. Sponsored by USDOE, Washington, DC (United States);New York State Energy Research and Development Authority, Albany, NY (United States). DOE Contract AC06-76RL01830. Contract 1725-EEED-IEA-92. (CONF-940131–5: 5. annual symposium on global change studies, Nashville, TN (United States), 24-28 Jan 1994). Order Number DE94007479. Source: OSTI; NTIS; GPO Dep.

Water vapor plays a fundamental role in weather and climate. It is the most important greenhouse gas and the most variable in space and time. The DOE Atmospheric Radiation Measurement program is devoting a large fraction of its resources for the accurate characterization of the column abundance and the distribution of water vapor with altitude. Balloon sondes, microwave radiometers, and Raman lidars are the major instruments either currently in use or under consideration for these tasks. Although the Multi-Filter Rotating Shadowband Radiometer (MFRSR) is primarily intended for use in accurate measurements of spectral short-wave radiation and in the measurement of spectral extinction by aerosol, it has the potential to measure total column water vapor as well. In this paper the authors report on a preliminary investigation of the MFRSR's capabilities with regard to accurate measurements of total column water vapor at times when there is a clear path to the sun, i.e., cloudless conditions.

13059 (RERF-TR–8-91) **Radon concentrations in residential housing in hiroshima and nagasaki.** Aoyama, Takashi; Radford, E.P.; Yonehara, Hidenori; Kato, Hiroo; Sakanoue, Masanobu. Radiation Effects Research Foundation, Hiroshima (Japan). May 1993. 21p. Order Number DE94748534. Source: OSTI; NTIS; INIS.

A survey of indoor radon (^{222}Rn) concentrations in Hiroshima and Nagasaki was carried out to assess the range of exposures expected among atomic-bomb survivors. Two hundred dwellings (100 from each city), chiefly of members of the Radiation Effects Research Foundation Life Span Study, were selected for this survey. We used two types of etched-track alpha-particle detectors: a Terradex detector (type SF) and an improved bare-track detector. Comparative measurements showed that although there was an adequate correlation between the values obtained using the two detectors, the geometric mean value for the bare-track detector was 45% lower than that for the Terradex detector. This difference was considered to be due to differences in the calibration methods and in the sensitivities of the detectors to thoron (^{220}Rn). The geometric mean values of the radon concentrations for 193 locations in Hiroshima and 192 locations in Nagasaki measured by Terradex SF detectors were 51.8 Bq/m^3 and 26.5 Bq/m^3, respectively. The large difference is attributable to the different geological environments of the two cities. Factors correlating with the indoor radon

concentrations were also studied. The geometric mean concentration was significantly higher in wooden houses with clay walls than in other types of house. This tendency was especially strong in Hiroshima. The difference between the estimated dose equivalents for exposure to radon decay products in dwellings in Hiroshima and Nagasaki during the last 30 years might amount to 0.8 Sv; however, no statistically significant difference was observed in lung-cancer mortality in the low-dose range in either city. Nevertheless, the indoor radon concentrations estimated in this survey could have a significant influence on the dose-response relationship for atomic-bomb exposure. (author).

13060 (WSRC-MS–93-586) **A numerical comparison of sensitivity analysis techniques.** Hamby, D.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007191. Source: OSTI; NTIS; GPO Dep.

Engineering and scientific phenomena are often studied with the aid of mathematical models designed to simulate complex physical processes. In the nuclear industry, modeling the movement and consequence of radioactive pollutants is extremely important for environmental protection and facility control. One of the steps in model development is the determination of the parameters most influential on model results. A "sensitivity analysis" of these parameters is not only critical to model validation but also serves to guide future research. A previous manuscript (Hamby) detailed many of the available methods for conducting sensitivity analyses. The current paper is a comparative assessment of several methods for estimating relative parameter sensitivity. Method practicality is based on calculational ease and usefulness of the results. It is the intent of this report to demonstrate calculational rigor and to compare parameter sensitivity rankings resulting from various sensitivity analysis techniques. An atmospheric tritium dosimetry model (Hamby) is used here as an example, but the techniques described can be applied to many different modeling problems. Other investigators (Rose; Dalrymple and Broyd) present comparisons of sensitivity analyses methodologies, but none as comprehensive as the current work.

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Refer also to citation(s) 11494, 11665, 11671, 11682, 11687, 11689, 11690, 11695, 11696, 11721, 11732, 11750, 11759, 11767, 11769, 11770, 11778, 11793, 11798, 11801, 11805, 11809, 11817, 11826, 11827, 11829, 11832, 11833, 11834, 11839, 11840, 11841, 11842, 11854, 11861, 11862, 11864, 11933, 12104, 12105, 12106, 12192, 12303, 12308, 12314, 12316, 12440, 12639, 12660, 12719, 12845, 13011, 13039, 13059, 13125, 13130, 13318, 13329, 13332, 13333, 13335

13061 (ANL/CMT/CP–82019) **Aqueous biphasic extraction.** Chaiko, D.J. Argonne National Lab., IL (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940225–38: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE94006814. Source: OSTI; NTIS; GPO Dep.

The aqueous biphasic separation (ABS) process, which involves the selective partitioning of ultrafine particles or solutes between two immiscible aqueous phases, is being evaluated for removing uranium from contaminated clay soils. Goal is to remove ultrafine U from the soil, leaving residues below regulatory cleanup limits. Tests were made using U-contaminated soil near the Fernald waste incinerator; over 80% of the soil is <45 μm. All the biphasic systems used polyethylene glycol in combination with inorganic salt phase. Results: U was reduced from 500–600 mg/kg to about 90 mg/kg, and in some cases even down to 15 mg/kg. However, a soil sample from the Fernald storage pad area did not give encouraging results. Selective flocculation of soil particles and dissolution of U in the salt phase occurred but were not troublesome. Scaleup tests using uncontaminated clay mineral feed were successful. Operating costs for soil remediation using ABS is estimated to be $25–50 per ton. A pilot-scale column is being installed at ANL.

13062 (ANL/CMT/PP–71738) **Leaching patterns and secondary phase formation during unsaturated leaching of UO_2 at 90°C.** Wronkiewicz, D.J.; Bates, J.K.; Gerding, T.J.; Veleckis, E.; Tani, B.S. Argonne National Lab., IL (United States). Nov 1991. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008483. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments are being conducted that examine the reaction of UO_2 with dripping oxygenated ground water at 90°C. The experiments are designed to identify secondary phases formed during UO_2 alteration, evaluate parameters controlling U release, and act as scoping tests for studies with spent fuel. This study is the first of its kind that examines the alteration of UO_2 under unsaturated conditions expected to exist at the proposed Yucca Mountain repository site. Results suggest the UO_2 matrix will readily react within a few months after being exposed to simulated Yucca Mountain conditions. A pulse of rapid U release, combined with the formation of dehydrated schoepite on the UO_2 surface, characterizes the reaction between one to two years. Rapid dissolution of intergrain boundaries and spallation of UO_2 granules appears to be responsible for much of the U released. Differential release of the UO_2 granules may be responsible for much of the variation observed between duplicate experiments. Less than 5 wt % of the released U remains in solution or in a suspended form, while the remaining settles out of solution as fine particles or is reprecipitated as secondary phases. Subsequent to the pulse period, U release rates decline and a more stable assemblage of uranyl silicate phases are formed by incorporating cations from the ground water leachant. Uranophane, boltwoodite, and sklodowskite appear as the final solubility limiting phases that form in these tests. This observed paragenetic sequence (from uraninite to schoepite-type phases to uranyl silicates) is identical to those observed in weathered zones of natural uraninite occurrences. The combined results indicate that the release of radionuclides from spent fuel may not be limited by U solubility constraints, but that spallation of particulate matter may be an important, if not the dominant release mechanism affecting release.

13063 (ANL/ER/RP–81524) **Technical action plan at former Commodity Credit Corporation grain storage sites in Nebraska, Kansas, Iowa, and Missouri: Revision 2.** Argonne National Lab., IL (United States). Oct 1993. 44p. Sponsored by Department of Agriculture, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94005395. Source: OSTI; NTIS; GPO Dep.

This document has been prepared for the Commodity Credit Corporation of the US Department of Agriculture (CCC/USDA), to provide an outline for a multiyear plan for technical investigations at sites in Kansas and Nebraska that have been identified as having groundwater contamination. Carbon tetrachloride is the primary contaminant of concern at sites in Nebraska and Kansas where former CCC/USDA grain storage facilities were located. At this time, no former CCC/USDA grain bin sites in Iowa and Missouri have been determined to have contamination at or above the maximum concentration level (MCL). This document represents a second revision to an original plan proposed by the CCC/USDA in January 1992 (Technical Action Plan at Former Commodity Credit Corporation Grain Storage Sites in Nebraska and Kansas). The CCC/USDA recognizes the need to address the reported groundwater contamination problems in a timely manner. Doing so will protect public drinking water supplies, public health, and the environment. To address these groundwater contamination problems, the CCC/USDA has committed and continues to commit resources and funding to investigate the contaminated sites further.

13064 (ANL/ESD/TM–59) **Heavy-metal contamination on training ranges at the Grafenwoehr Training Area, Germany.** Zellmer, S.D.; Schneider, J.F. Argonne National Lab., IL (United States). Energy Systems Div. May 1993. 69p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008041. Source: OSTI; NTIS; GPO Dep.

Large quantities of lead and other heavy metals are deposited in the environment of weapons ranges during training exercises. This study was conducted to determine the type, degree, and extent of

heavy-metal contamination on selected handgun, rifle, and hand-grenade ranges at Grafenwoehr Training Area, Germany. Soil, vegetation, and surface-water samples were collected and analyzed using the inductively-coupled plasma atomic-emission spectroscopy (ICP-AES) method and the toxic characterization leaching procedure (TCLP). The ICP-AES results show that above-normal levels of lead and copper are in the surface soil at the handgun range, high concentrations of lead and copper are in the berm and soil surface at the rifle range, and elevated levels of cadmium and above-normal concentrations of arsenic, copper, and zinc are present in the surface soil at the hand-grenade range. The TCLP results show that surface soils can be considered hazardous waste because of lead content at the rifle range and because of cadmium concentration at the hand-grenade range. Vegetation at the handgun and rifle ranges has above-normal concentrations of lead. At the hand-grenade range, both vegetation and surface water have high levels of cadmium. A hand-held X-ray fluorescence (XRF) spectrum analyzer was used to measure lead concentrations in soils in a field test of the method. Comparison of XRF readings with ICP-AES results for lead indicate that the accuracy and precision of the hand-held XRF unit must improve before the unit can be used as more than a screening tool. Results of this study show that heavy-metal contamination at all three ranges is limited to the surface soil; heavy metals are not being leached into the soil profile or transported into adjacent areas.

13065 (CONF-9307151–1) **Bison and fire: Landscape analysis of ungulate response to Yellowstone's fires.** Wallace, L.L. (Oklahoma Univ., Norman, OK (United States). Dept. of Botany and Microbiology); Turner, M.G.; Wu, Yegang; Romme, W.H. Oak Ridge National Lab., TN (United States). [1993]. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1. international Bison conference; La Crosse, WI (United States); 27 Jul 1993. Order Number DE94001138. Source: OSTI; NTIS; GPO Dep.

A simulation model of bison survival under different scenarios of winter severity, fire size, fire pattern and population size was run. Previous work had shown the model to be realistic. The overriding factor influencing bison winter survival in the model was winter severity. This factor had significant interactions with fire size and population size as well, further reducing survival in all cases. Increasing fire size reduced survival the first year after a simulated fire, but increased survival two years after the fire. This was due to enhanced forage production in burned areas the second year. A threshold effect on survival was noted at fire sizes greater than 60% of the simulated landscape, a number which is critical in disturbance propagation in landscapes. There was no biologically important effect of fire pattern (random vs. clumped) on survival.

13066 (DOE/AL/62350–90D) **UMTRA project water sampling and analysis plan, Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007200. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) provides the basis for ground water sampling at the Ambrosia Lake Uranium Mill Tailings Remedial Action (UMTRA) Project site during fiscal year 1994. It identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequency for the monitoring locations and will be updated annually. The Ambrosia Lake site is in McKinley County, New Mexico, about 40 kilometers (km) (25 miles [mi]) north of Grants, New Mexico, and 1.6 km (1 mi) east of New Mexico Highway 509 (Figure 1.1). The town closest to the tailings pile is San Mateo, about 16 km (10 mi) southeast (Figure 1.2). The former mill and tailings pile are in Section 28, and two holding ponds are in Section 33, Township 14 North, Range 9 West. The site is shown on the US Geological Survey (USGS) map (USGS, 1980). The site is approximately 2100 meters (m) (7000 feet [ft]) above sea level.

13067 (DOE/AL/62350–97D) **UMTRA Project water sampling and analysis plan, Falls City, Texas.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94007203. Source: OSTI; NTIS; GPO Dep.

Surface remedial action will be completed at the Falls City, Texas, Uranium Mill Tailings Remedial Action Project site in the spring of 1994. Results of water sampling activity from 1989 to 1993 indicate that ground water contamination occurs primarily in the Deweesville/Conquista aquifer (the uppermost aquifer) and that the contamination migrates along four distinct contaminant plumes. Contaminated ground water from some wells in these regions has significantly elevated levels of aluminum, arsenic, cadmium, manganese, molybdenum, selenium, sulfate, and uranium. Contamination in the Dilworth aquifer was identified in monitor well 977 and in monitor well 833 at the southern edge of former tailings pile 4. There is no evidence that surface water quality in Tordilla and Scared Dog Creeks is impacted by tailings seepage. The following water sampling activities are planned for calendar year 1994: (1) Ground water sampling from 15 monitor wells to monitor the migration of the four major contaminant plumes within the Deweesville/Conquista aquifer. (2) Ground water sampling from five monitor wells to monitor contaminated and background ground water quality conditions in the Dilworth aquifer. Because of disposal cell construction activities, all plume monitor wells screened in the Dilworth aquifer were abandoned. No surface water locations are proposed for sampling. The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and ground water flow conditions in the Deweesville/Conquista aquifer downgradient of the disposal cell. The list of analytes has been modified with time to reflect constituents currently related to uranium processing activities and natural uranium mineralization. Water sampling is normally conducted biannually in late summer and midwinter.

13068 (DOE/CE/15558–T1) **First quarter technical progress report for Thermally Modified Sand.** Gilfilian, R.E. Gilfilian Engineering and Environmental Testing, Inc., Anchorage, AK (United States). 28 Feb 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93CE15558. Order Number DE94007448. Source: OSTI; NTIS; GPO Dep.

This report documents progress on a project to demonstrate suitability of Thermally Modified Sand (TMS) for large scale use by demonstrating its performance on icy roadways maintained by the State of Alaska Department of Transportation. This report deals primarily with the startup of the project and includes initial observations of the effectiveness of the use of the TMS versus the typical salt/sand combination.

13069 (DOE/EW/50625–T14) **Environmental Hazards Assessment Program: Quarterly report, October–December 1993.** Medical Univ. of South Carolina, Charleston, SC (United States). Feb 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE94007160. Source: OSTI; NTIS; GPO Dep.

This report describes activities and reports on progress for the second quarter (October 93 - December 93) of the second year of the grant to support the Environmental Hazards Assessment Program (EHAP). It reports progress against grant objectives and the Program Implementation Plan published at the end of the first year of the grant.

13070 (DOE/NV/10630–57) **CASCADER: An m-chain gas-phase radionuclide transport and fate model: Volume 2, User's manual for CASCADR8.** Cawlfield, D.E.; Been, K.B.; Emer, D.F.; Lindstrom, F.T.; Shott, G.J. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Jun 1993. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-89NV10630. Order Number DE94007953. Source: OSTI; NTIS; INIS; GPO Dep.

Chemicals and radionuclides move either in the gas-phase, liquid-phase, or both phases in soils. They may be acted upon by either biological or abiotic processes through advection and/or diffusion. Furthermore, parent and daughter radionuclides may decay as they are transported in the soil. This is volume two to the CASCADER series, titled CASCADR8. It embodies the concepts presented in volume one of this series. To properly understand how the CASCADR8 model works, the reader should read volume one first. This volume presents the input and output file structure

for CASCADR8, and a set of realistic scenarios for buried sources of radon gas.

13071 (DOE/NV/10845–31) **Hydrologic database user's manual.** Champman, J.B.; Gray, K.J.; Thompson, C.B. Nevada Univ., Reno, NV (United States). Water Resources Center. Sep 1993. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-90NV10845. Order Number DE94003950. Source: OSTI; NTIS; GPO Dep.

Publication No. 45115.

The Hydrologic Database is an electronic filing cabinet containing water-related data for the Nevada Test Site (NTS). The purpose of the database is to enhance research on hydrologic issues at the NTS by providing efficient access to information gathered by a variety of scientists. Data are often generated for specific projects and are reported to DOE in the context of specific project goals. The originators of the database recognized that much of this information has a general value that transcends project-specific requirements. Allowing researchers access to information generated by a wide variety of projects can prevent needless duplication of data-gathering efforts and can augment new data collection and interpretation. In addition, collecting this information in the database ensures that the results are not lost at the end of discrete projects as long as the database is actively maintained. This document is a guide to using the database.

13072 (DOE/NV/10872–T92) **Analytical laboratory and mobile sampling platform: Progress report, October 1, 1993–December 31, 1993.** Stetzenbach, K. Nevada Univ., Las Vegas, NV (United States). Harry Reid Center for Environmental Studies. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94007778. Source: OSTI; NTIS; GPO Dep.

Three compounds, trifluoromethane (CHF_3), 1,1,1,2- tetrafluoroethane (TFA), and octafluoropropane (C_3H_8), were compared to SF_6 for use as vapor phase tracers. Dichlorodifluoromethane was also used once for comparison. Experiments were done to test sorption/degradation in a medium colored tuff with (saturated) and without water. A gas chromatograph with an electron capture detector was used. Detection limits were determined.

13073 (DOE/NV/10872–T93) **Fingerprinting of groundwater by ICP-MS: Progress report, October 1, 1992–December 31, 1992.** Stetzenbach, K. Nevada Univ., Las Vegas, NV (United States). Harry Reid Center for Environmental Studies. [1992]. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC08-90NV10872. Order Number DE94007779. Source: OSTI; NTIS; GPO Dep.

Enclosed in this report are the results of the analyses for the trace metals of the third sampling of Ash Meadows and Death Valley springs. The samples were analyzed for a total 66 constituents, including: major cations, major union, and rare earth elements. The data are complete except for the lanthanum and cerium results for the Ash Meadows springs. There was significant, but as yet an undetermined source of contamination for these two elements. We are presently attempting to determine the source of the contamination. The results of the major cations and anions will be included in the next report.

13074 (DOE/OR/22160–T5) **Demonstration testing and evaluation of in situ soil heating: Management Plan.** Dev, H. IIT Research Inst., Chicago, IL (United States). [1993]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE94007161. Source: OSTI; NTIS; GPO Dep.

This document is the Management Plan for US DOE contract entitled, "Demonstration, Testing and Evaluation of In Situ Soil Heating," Contract No. DE-AC05-93OR22160, IITRI Project No. C06787. In this project IITRI will demonstrate an in situ soil heating technology for the removal of hazardous organic contaminants present in the soil. In situ heating will be accomplished by the application of 60 Hz ac power to the soil. The soil will be heated to a temperature of about 90°C. This technology is suited for the removal of those organic compounds which have a normal boiling point in the range of 100° to 210°C, or else for those which exhibit a pure component vapor pressure of at least 10 mm Hg in the 90° to 100°C temperature range. For example, perchloroethylene, dichlorobenzene, trichlorobenzene, etc. may be removed by in situ ac heating. It is planned to demonstrate the technology by heating approximately 400 tons of soil in the K-1070 Classified Burial Ground located at DOE's K-25 Site located in Oak Ridge, TN. It is estimated that the heating portion of the demonstration will take approximately 3 weeks at an average power input rate of 150 to 175 kW. IITRI expects to spend considerable time in the front end reviewing site characteristics, preparing detail design, developing Health and Safety Plans and other documents needed to obtain regulatory approval for the demonstration, arranging for site sampling, infrastructure development and document preparation. It is anticipated that site activities will begin in approximately 5 to 6 months. This contract was signed on September 30, 1993. IITRI started work on it in October 1993. It is planned to complete the demonstration and submit approved final reports by September 30, 1994. This project has 12 tasks and four major milestones. The major milestones and their planned completion dates are shown.

13075 (DOE/WIPP–93-022) **Waste Isolation Pilot Plant Groundwater Protection Management Program Plan.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. [1993]. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE94008049. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE has mandated in DOE Order 5400.1 that its operations will be conducted in an environmentally safe manner. The Waste Isolation Pilot Plant (WIPP) will comply with DOE Order 5400.1 and will conduct its operations in a manner that ensures the safety of the environment and the public. This document outlines how the WIPP will protect and preserve groundwater within and surrounding the WIPP facility. Groundwater protection is just one aspect of the WIPP environmental protection effort. The WIPP groundwater surveillance program is designed to determine statistically if any changes are occurring in groundwater characteristics within and surrounding the WIPP facility. If a change is noted, the cause will be determined and appropriate corrective action initiated.

13076 (EGG–11265-2029) **Effects of soil quality and depth on seed germination and seedling survival at the Nevada test site.** Blomquist, K.W.; Lyon, G.E. EG and G Energy Measurements, Inc., Las Vegas, NV (United States). [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-93NV11265. (CONF-9310276–3: 8. wildland shrub and arid land restoration symposium, Las Vegas, NV (United States), 19-21 Oct 1993). Order Number DE94006476. Source: OSTI; NTIS; INIS; GPO Dep.

The Nuclear Waste Policy Act, as amended in 1987, directs the US Department of Energy (DOE) to study Yucca Mountain, in southern Nevada, as a potential site for long-term storage of high-level nuclear waste. DOE policy mandates the restoration of all lands disturbed by site characterization activities and DOE has developed an environmental program that is to be implemented during site characterization activities at Yucca.Mountain. DOE is currently conducting reclamation feasibility trials as part of this environmental program. No topsoil was saved on disturbances during early site investigation and minimal soil remains at existing disturbances on Yucca Mountain. A study was developed to test the effects of soil quality and depth on seedling emergence and survival. A series of plots was established and two treatments were tested. The first treatment compared native topsoil to subsoil imported from a borrow pit. The second treatment compared four different depth ranges of both soil types. All plots received identical seeding treatments. Seedling density was measured after emergence. Overall seedling densities were low, averaging 10.3 ± 8.8 (SD) plants/m^2. Statistical analysis revealed a significant interaction between the two treatment factors. The subsoil had increasing densities from the deep soil depths to the shallow depths while the topsoil had increasing densities from the shallow soil depths to the deep depths. The cause of this interaction may have resulted from the bedrock being close to the soil surface of the shallow plots.

13077 (ENEA-RT-AMB–93-13) **Montecuccolino (University of Bologna, Italy) 1991 environmental radioactivity measurements.** Bassi, P. (ENEA, Bologna (Italy). Centro Ricerche Energia

'E. Clementel' - Area Energetica); Bonini, E.; Filippi, G.; Rossi, G.; Zuppiroli, S. No corporate text available. 1993. 17p. (In Italian). (RT/AMB–93-13). Order Number DE94752552. Source: OSTI; NTIS (US Sales Only).

Radioactivity measurement results, in environmental and food samples collected during 1991 in Montecuccolino (Bologna), are presented. Sampling methods and measurement techniques are also described.

13078 (ETDE-IT–94-36) **Social acceptability of new territorial development projects.** Istituto Internazionale 'Jacques Maritain', Rome (Italy). May 1993. 173p. (In Italian). Quaderni Studi 18. Order Number DE94752605. Source: OSTI; NTIS (US Sales Only); INIS.

This paper reviews the historical evolution of environmental awareness over the last three decades. The aspects covered include: the growing economic interdependence of nations, the development of new technologies, the internationalization of human rights and the phenomenon of organized trans-nationalism. The paper then develops a framework of territorial development assessment criteria embodying the United Nation's approach towards sustainable growth in which the rights of the human individual to a healthy life in harmony with nature are placed at the forefront of all sustainable growth decision making. Examples of decisional processes during actual hearings to decide on the go-ahead of energy development projects in Italy (a district heating system and a combined cycle gas turbine power plant) are given to evidence optimum ways to have public participation and interaction with government and expert committees take place in line with the United Nation's approach towards development. An important element dealt with is how to optimize the dissemination and use of information.

13079 (EUR–14877, pp. 131-141) **Swedish activities in the Oklo natural analogue project.** Smellie, J.A.T. (Conterra AB, Uppsala (Sweden)); Winberg, A.; Karlsson, F. Commission of the European Communities, Luxembourg (Luxembourg). 1993. (CONF-9204280–: 2. Joint CEC-CEA Progress Meeting of the Oklo Working Group, Brussels (Belgium), 6-7 Apr 1992). In *Oklo working group meeting.* 199p. Order Number DE94612684. Source: OSTI; NTIS (US Sales Only); INIS.

Presently, many countries are concerned about the need for a safe method to dispose of high-level nuclear wastes. The various national regulatory agencies involved generally require quantitative predictions for at least the first 10^4 years after disposal, and qualitative predictions of repository safety performance for up to 10^6 years. Predicting what this future behaviour will be can be considerably facilitated by comparison with the evolution of parallel natural geochemical systems, particularly those rich in radioelements. Such natural systems provide a unique opportunity to test, by observation and measurement, many of the geochemical processes that are expected to influence the predicted reliability of high-level radioactive waste containment deep in the bedrock for long periods of geological time, providing direct and indirect validation support for some of the models and data used in performance assessment. Oklo, by virtue of representing a fossil natural reactor which achieved criticality some 2 000 Ma ago, provides a unique opportunity to show whether the stable nuclear fission end-products have remained, in the near-vicinity of the reactor zone subsequent to fission. Furthermore, the materials found in the Oklo reactors resemble closely important waste forms such as spent nuclear fuel and bitumised residue and have been subject to extreme geochemical reactions and radiolysis when related to expected site disposal conditions, and for a much longer time. In order to study such effects, not only do the reactor zones require further detailed mineralogical, geochemical and radiochemical study, but equally the geological setting and hydrological environment of the reactor zones also need to be understood. For this reason SKB are interested to study the spatial distribution of the reactor zones at Oklo, Okelobondo and Bagombe in the context of the large-and small-scale groundwater hydraulics of the host sedimentary rocks. (author). 7 refs., 1 fig.

13080 (EUR–15004) **Laboratory and in situ determination of the migration processes of actinide complexes and colloids in a fissured granitic environment. El Berrocal project (preliminary activities - phase 0).** Astudillo, J. (Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas (CIEMAT), Madrid (Spain)); Del Olmo, C. Commission of the European Communities, Luxembourg (Luxembourg). 1993. 117p. Contract FI1W/0230-E. Source: OSTI; NTIS (US Sales Only); INIS.

The experimental site of El Berrocal has been chosen for a study of the migration of natural radionuclides in a fractured granitic environment. The granite is classified as an alkaline feldspar-rich quartz granite with two micas. The fresh granite is affected by hydrothermal alteration processes related to fractures, which has led to a strong sericitization of albite, and the precipitation of secondary chlorites and carbonates. The most important U-bearing and Th-bearing accessory minerals are uraninite, thorite-auerlite, monazite, anatase, apatite and zircon. Approximately 65% of the total of U in the rock is held as uraninite. In the altered granite, most of the U is held as autunite. Hydrogeochemical data show that Co_2/H_2 CO_3 is the dominant system, followed by the silica-silicate system. Based on their stability analyses, two zones can be defined: (i) waters north of the dyke and from deep zones where calcite is in equilibrium and albite and gibbsite precipitate, and (ii) surface waters, south of the dyke, subsaturated in relation to calcite, producing the alteration of albite and the precipitation of montmorillonite. The size distribution of the colloids varies, depending on the treatment given to the water samples. The particles are mainly composed of K-feldspars and clay minerals (smectite) and occasionally by quartz, mica, calcite and pollen. The El Berrocal groundwaters have a very low amount of organic matter. Column migration tests have been carried out and were performed with intact granitic cores and with crushed granite. Np proved to be an adequate radionuclide for these experiments. Under oxic conditions and in the absence of organic matter, it was completely retained in both types of columns, whereas in the presence of organic matter a more rapid breakthrough was observed. Under anoxic conditions, and with or without organic matter, Np was found to move faster than under oxic conditions. (author). 13 refs., 46 figs., 23 tabs.

13081 (GSF–6/93) **Ecological and chemical investigations of the environmental quality in the five new Laender. Pt. 5: Polychlorinated biphenyls.** Heinisch, E. (Institut fuer Oekosystemforschung Berlin-Halle (IfOE), Berlin (Germany)); Klein, S.; Kettrup, A.; Steinberg, C. GSF - Forschungszentrum fuer Umwelt und Gesundheit GmbH, Neuherberg (Germany). May 1993. 145p. (In German). Order Number DE94752448. Source: OSTI; NTIS (US Sales Only).

The report attempts to establish time- and site-dependent causal relationships for contamination. For this purpose, contamination levels were measured in soil, inland water, fish and mussels, drinking water and well water, meat of farm animals and wild boars, chicken eggs, milk and butter, bird eggs and tissues in terrestrial food chains, water and fish from the Baltic Sea, as well as mother's milk. (orig./EF)

13082 (IAEA-TECDOC–726) **Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.** International Atomic Energy Agency, Vienna (Austria). Nov 1993. 155p. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Radon 222 seems to be one of the most promising precursors and is the tracer for which more data are available: according to statistics elaborated in China, 70% of earthquakes are preceded by radon anomalies detectable in soil, air and/or in groundwater. Also other changes of the fluid chemical composition and variations of $^3He/^4He$, $^2H/^1H$, $^{13}C/^{12}C$, $^{18}O/^{16}O$ isotopic ratios have been detected. Among these indicators one can mention variations in concentration and/or isotopic ratios of hydrogen, helium, carbon, oxygen, neon, radon, radium and uranium. Refs, figs, tabs.

13083 (IAEA-TECDOC–726, pp. 9-22) **Radon as a precursor of earthquakes.** Dubinchuk, V.T. (International Atomic Energy Agency, Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109445–: 3. research coordination meeting on the use of nuclear and nuclear-related techniques in the study of environmental pollution associated with solid wastes, Vienna (Austria), 10-13 Sep 1991). In *Isotopic and*

geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991. 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

This is a short historical review on the use and study of radon concentration variations in groundwater and soil air as a possible precursor of earthquakes and other events affected by accumulation and variation of strains in rock massifs. An analysis of the main features of radon signals in hydrogeochemical systems is presented and possible mechanisms of radon earthquake forerunners are discussed. It is assumed that the initial stage of any radon transfer from a rock matrix mineral in a strained state into pore fluid has a thermo-molecular activation character obeying general kinetic laws. On this basis a new model for radon anomalies has been developed where so-called convertion coefficients, kinetic complexes, kinetics of radioactive decay, first order transfer processes (sorption, for example) and hydraulic transport (turnover) are involved. All of these kinetic parameters are related to some characteristic residence time for a given precursor in a given system. Both groups of parameters are governing amplitude and forms of radon precursor output curves. The main characteristics of precursors in hydrogeochemical systems are the residence time distribution functions for water (RTDFw) and precursor components (RTDFc). The functions can be evaluated by means of well known isotope hydrology tracer techniques. Some methodological consequences and recommendations how to use isotope hydrology data are given for the analysis and interpretation of the radon (and of other hydrochemical) precursor signals of earthquakes. (author). 84 refs, 16 figs.

13084 (IAEA-TECDOC–726, pp. 22-37) **Gas-geochemical approaches to earthquake prediction.** King Chiyu (Geological Survey, Menlo Park, CA (United States)). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Concentrations of a wide range of terrestrial gases in ground water and soil air have commonly been found to be anomalously high along active faults, suggesting that the faults may be paths of least resistance for the outgassing process of the "solid" earth. Anomalous temporal gas-concentration changes with durations of a few hours to many months have been recorded before many large and some smaller earthquakes at stations mostly located along active faults at epicentral distances of as much as several earthquake-source dimensions where the associated coseismic strain changes are estimated to be as small as 10^{-8}. This result suggests that the earthquakes and the associated anomalies are both incidental results of some small but broad-scale episodic strain changes in the crust. Such strain changes may be amplified at the earthquake and anomaly sites and, together with sufficient pre-existent stresses, may reach some critical levels (above half fracture strengths) for generation of the earthquakes and anomalies. Significant gas-concentration changes have also been observed at times of other known crustal disturbances, such as underground explosions, ground-water pumping, and earth tide, and from stressed rock samples in laboratory experiments. These results suggest several possible mechanisms for the deformation-related gas-emission changes that involve movement of crustal fluids of non-uniform chemical composition or enhanced water/rock reaction at newly created rock surfaces. However, gas-concentration changes may also be caused by various non-tectonic environmental changes, which must be recognized in the search of true earthquake precursors. (author). 30 refs, 32 figs.

13085 (IAEA-TECDOC–726, pp. 37-43) **Radon measurements in Austria and some basic problems in earthquake prediction research.** Friedmann, H. (Vienna Univ. (Austria). Inst. fuer Radiumforschung und Kernphysik). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Some basic problems in earthquake prediction research are discussed in connection with the analysis of spring water radon (^{222}Rn) measurements in Austria. Two possibilities for the definition of an anomaly are proposed. In the analysed data two periods of outstanding radon concentration could be observed. The data were carefully analyzed using different methods but the extreme radon concentrations could not be explained by an influence of vadose water or by meteorological effects or other non-tectonic disturbances. These two periods were identified as anomalies when using the proposed definition of anomaly. Contingency table tests give high probabilities (>90%) for a correlation between certain earthquakes and the observed radon anomalies. The investigations result in the following hypothesis: The probability for the occurrence of an earthquake in the area 42 deg. N$\leq\phi\leq$47.5 deg. N, 13 deg. E$\leq\lambda\leq$20 deg. E, Friuli area excluded, with a magnitude M greater as a certain well defined level, increases during the time of an anomaly in the radon concentration of the Freibadquelle by about a factor of ten. To test this hypothesis a new set of radon data is necessary. However this new set of radon data is still not large enough to reach a sufficient statistical proof. Finally, some recommendations are given in order to improve the possibilities for comparing and judging predictions. (author). 24 refs, 6 figs, 1 tab.

13086 (IAEA-TECDOC–726, pp. 44-48) **Geochemical precursors of earthquakes - Experience in Italy.** Valenza, M. (Consiglio Nazionale delle Ricerche, Palermo (Italy). Ist. di Geochimica dei Fluidi); Nuccio, P.M. International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Herewith are presented the results of geochemical observations carried out in Italy over the last years referring to volcanic and seismic areas (Vulcano, Etna, Eastern Sicily). The results indicate that some geological parameters can be used as effective precursors of earthquakes; however, the choice of those parameters is strictly related to the geochemical properties of each area. To accomplish the goal of earthquake prediction a multi-disciplinary and methodologically homogeneous approach is here suggested which should be carried out in different areas of the world. (author). 13 refs, 11 figs, 1 tab.

13087 (IAEA-TECDOC–726, pp. 48-62) **Fluidodynamical and chemical features of radon 222 related to total gases: Implications for earthquake predictions.** Martinelli, G. (Servizio Informativo e Statistica, Regione Emilia Romagna, Bologna (Italy)). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

During the earthquake preparation a zone of cracked rocks is formed in the area of future earthquake focal zone under the influence of tectonic stresses. The area of preparation of the seismic event is characterized by the occurrence of many precursory phenomena with particular reference to Radon 222. The main geochemical and geophysical relations useful in understanding Radon occurrences in deep fluids have been discussed with the help of some Italian case histories. Experiments have been carried out to test the reliability of some precursors related equations. Geochemical and geophysical characters of the above mentioned fluids are discussed with the aim of making a contribution towards understanding the relations among Radon 222 anomalies and other precursory related fluids. (author). Refs, 9 figs.

13088 (IAEA-TECDOC–726, pp. 63-87) **Some isotopic and geochemical anomalies observed in Mexico prior to large**

scale earthquakes and volcanic eruptions. Cruz Reyna, S. de la (Universidad Nacional Autonoma de Mexico, Mexico City (Mexico). Inst. de Geofisica); Armienta Hernandez, M.A.; Segovia, N. International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

A brief account of some experiences obtained in Mexico, related with the identification of geochemical precursors of volcanic eruptions and isotopic precursors of earthquakes and volcanic activity is given. The cases of three recent events of volcanic activity and one large earthquake are discussed in the context of an active geological environment. The positive results in the identification of some geochemical precursors that helped to evaluate the eruptive potential during two volcanic crises (Tacana 1986 and Colima 1991), and the significant radon-in-soil anomalies observed during a volcanic catastrophic eruption (El Chichon, 1982) and prior to a major earthquake (Michoacan, 1985) are critically analyzed. (author). Refs, figs and tabs.

13089 (IAEA-TECDOC–726, pp. 87-107) **Conclusions on the possible variations of chemical and isotopic composition of groundwater systems in response to changed hydrodynamic conditions (based on investigations of deep groundwater systems and thermal-mineral waters and brines in tectonic active areas).** Balderer, W. (ETH Zuerich, Zuerich (Switzerland). Ingenieurgeologie). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

To establish an observation network of possible parameters to be used as precursors of earthquakes or volcanic eruptions it is necessary first to understand the natural conditions of a given groundwater system and the possible variations of groundwater chemistry and isotopic composition. In the presented study three sites within tectonic active areas in Western Turkey were discussed and compared with the situation of the deep groundwaters in Northern Switzerland. (author). 35 refs, 19 figs.

13090 (IAEA-TECDOC–726, pp. 108-115) **Principles and methods of volcanic surveillance: The case of vulcano, Italy.** Nuccio, P.M. (Palermo Univ., Palermo (Italy). Ist. di Mineralogia, Petrografia e Geochimica); Valenza, M. International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

This paper is the report presented at the Advisory Group Meeting on the Isotopic and Geochemical Precursors of Earthquakes and Volcanic Eruptions, held from 9 to 12 September 1991 at International Atomic Energy Agency Headquarters in Vienna. The historical developments of the volcanic surveillance principles, from the empirical identification of a single precursor to the more organic modelistic approaches, are briefly reported. Geochemical methods are reviewed, the volcanic surveillance executed on the Volcano island is illustrated and the main results reported. (author). 24 refs, 12 figs.

13091 (IAEA-TECDOC–726, pp. 116-124) **Buildup of CO_2 in Lake Nyos and evaluation of recurrence of future gas outbursts.** Kusakabe, M. (Okayama Univ., Misasa, Tottori (Japan). Inst. for the Study of the Earth's Interior). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

On 21 August 1986 an outburst of lethal gas came from Lake Nyos, Cameroon, killed about 1700 people. The gas was found to be CO_2 dissolved in the lake; it was suddenly released from the lake to the atmosphere and flowed rapidly down valleys asphyxiating people and animals in its path. Isotopic analyses of carbon ($\delta^{13}C$ = -3/4 per mille) and helium ($^3He/^4He$ 5.7 R_{atm}) of the dissolved gases indicate that CO_2 and He are of mantle origin. The conductivity-temperature-depth profile measurements and chemical analyses of the lake water done during November 1986 and December 1988 revealed that the temperature, total dissolved solid and CO_2 content of the water increased markedly from 160 m to the bottom. This result supports the view that CO_2 is being supplied to the lake bottom in the form of warm, CO_2-charged, mineralized water favoring the "limnological" hypothesis rather than the "volcanic" one for the cause of the gas bursts in 1986. The heat and CO_2 fluxes at the bottom were estimated to be 0.43 MW and 1.0 Gmol/y, respectively. The CO_2 flux is large enough to saturate the lake's hypolimnion within about 30 years. Considering that the gas release may not require full saturation of the lake, another gas outburst could occur at any time. Regular geochemical and limnological monitoring of the lake is highly desirable in order to prevent future disasters. Remedial measures to remove CO_2 from the bottom water should also be taken. (author). 25 refs, 10 figs, 1 tab.

13092 (IAEA-TECDOC–726, pp. 124-130) **The Lake Nyos gas disaster: Conclusions and predictions.** Freeth, S.J. (University Coll. of Swansea, Swansea (United Kingdom). Geological Hazards Research Unit). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Lake Nyos is stable under normal circumstances, despite being highly charged with carbon dioxide, as it was both before and, to a lesser extent, after the 1986 disaster which killed an estimated 1700 people. Samples of gas collected from the lake contain mostly carbon dioxide, with a very small amount of methane and a trace of helium. Isotopic evidence for both the carbon dioxide and for the helium points unambiguously towards a primarily 'magmatic', rather than a biogenic, source for the gas. 22 refs, 1 fig.

13093 (IAEA-TECDOC–726, pp. 130-134) **The need of real-time devices for measuring volcanic and seismic signals.** Balcazar, M. (Instituto Nacional de Investigaciones Nucleares, Mexico City (Mexico)); Segovia, N.; Monnin, M.; Chavez, A.; Flores, J.H. International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

Radon emanation measurements in Mexican volcanic and seismic regions have been carried out since 1980. Radon stations are mainly located near the active volcanoes and along the Ocean Pacific coast were tectonic plaques produce most of the earthquakes in Mexico. Data has been collected by means of plastic passive detectors, automatic passive radon monitor, scintillation counters and recently with active solid state detectors. Developments and or adaptations of passive and active monitors have been necessary due to the lack of commercially existence, specially in the early days. (author). 20 refs, 4 figs.

13094 (IAEA-TECDOC–726, pp. 135-154) **Geochemical surveillance of active volcanic areas in Italy: Campi Flegrei Caldera and Vulcano island.** Tedesco, D. (Osservatorio Vesuviano, Naples (Italy)). International Atomic Energy Agency, Vienna (Austria). Nov 1993. (CONF-9109529–: Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic

eruptions, Vienna (Austria), 9-12 Sep 1991). In *Isotopic and geochemical precursors of earthquakes and volcanic eruptions: Proceedings of an advisory group meeting held in Vienna, 9-12 September 1991.* 155p. Order Number DE94615824. Source: OSTI; NTIS (US Sales Only); INIS.

In the last ten years the prediction of volcanic eruptions with geochemical methods has largely increased his reputation in the volcanological community. Two main areas have been studied in the last years: Campi Flegrei caldera and Vulcano island. In both volcanic areas the volcanism is at the moment quiescent with the last eruptions in the 1538 in Campi Flegrei and 1888 at Vulcano island. In this work our chemical and isotopic data will be discussed and for each volcanic area a simple volcanological model will be elaborated. Refs, 18 figs, 1 tab.

13095 (INIS-mf–13782) **An attempt for generalized evaluation of the minimal detectable activity in routine beta-radioactivity measurements.** Antonov, A.; Tosheva, Z. Ministry of Environment, Sofia (Bulgaria); Bulgarian Academy of Sciences, Sofia (Bulgaria). Inst. of Meteorology and Hydrology. 1993. 6p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94617767. Source: OSTI; NTIS (US Sales Only); INIS.

A methodological description of errors in routine beta detection measurements in radiometric laboratories is presented in order to explain the sources of errors and estimate quantitatively the thresholds of detectability of beta radiation activity in the air, in sediments and in water solution samples. Three types of errors are considered in connection with the sample quantity variations, the measurement conditions and the statistical limitations of the sampling. The ultimate detection limits are derived. The sensitivity values of the adopted measurement algorithms provided for the detection and analysis of radioactive contamination are determined. For a single sample 120 hours after the sampling and for average monthly contamination (30 samples) they are 1 and 0.2 mBq/m^3 for air, 0.5 and 0.1 Bq/m^2 for sediments and 0.6 and 0.1 - 0.5 Bq/l for water samples. The conclusion is that the adopted measurement practice assures sufficient level of accuracy in the detection of technogeneous radioactive contamination of the environment. (R.Ts.).

13096 (INIS-mf–13788) **Environmental radiation monitoring of the IRT-2000 research reactor in Sofia. Investigation of plutonium concentrations in soils and plants.** Jovchev, M.; Mishev, I.; Bogoeva, L.; Radicheva, M.; Sariev, D. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 5p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94617768. Source: OSTI; NTIS (US Sales Only); INIS.

The paper estimates the real values of the environmental plutonium contaminations in the vicinity of the IRT-2000 research reactor in Sofia. Soil and plant samples, taken before and after 1986 have been analyzed for plutonium-238, plutonium-239 and plutonium-240 by applying a quite sensitive and selective procedure. An alpha spectrometer with surface-barrier silicon detector has been used. The LLD is 0.0037 mBq.g-1 for soils and 0.0185 mBq.g-1 for plants. For comparison, the same kind of samples, taken from other regions of the country have been analyzed as well. A lichen sample taken before 1986 and a moss sample taken after 1986, both from the Vitosha mountain, have been analyzed as bioindicators. The data obtained demonstrate a complete absence of environmental plutonium contaminations, caused by the Research reactor in Sofia. (author).

13097 (IS–5104) **DNAPLs at DOE sites: Background and assessment of characterization technologies.** Junk, G.A.; Haas, W.J. Jr. Ames Lab., IA (United States). Dec 1993. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94007459. Source: OSTI; NTIS; GPO Dep.

The Characterization, Monitoring, and Sensor Technology Integrated Program (CMST-IP) within the Office of Technology Development (OTD) has responsibility for identification, evaluation, and delivery of technologies needed for the work of the Department of Energy's Office of Environmental Restoration and Waste Management. This report addresses part of that responsibility by providing summary information on DNAPL site characterization. A dense nonaqueous phase liquid (DNAPL) is a source of contamination that can persist in the subsurface for decades before dissipating completely into the vapor phase and groundwater. The DNAPL chemicals of particular concern to the DOE are chlorinated volatile organic compounds (Cl VOCS) such as carbon tetrachloride (CCl_4), trichloroethylene (TCE), and perchloroethylene (PCE). These Cl VOCs were used in multiple ton quantities at DOE sites and were often released to the subsurface. The predicted fate of released Cl VOC liquid is downward movement through the soil under the force of gravity. As it moves, some of the Cl VOC liquid becomes trapped in the soil pores as residual saturation. The liquid also moves rapidly downward if small fractures are present. This migration continues until an impermeable or semi-permeable layer is encountered. Then lateral movement or spreading occurs. The downward and lateral migration in the subsurface leads to DNAPL pools, lenses, and residual saturation that can cause long-term contamination of groundwater at levels well above drinking water standards. Although Cl VOCs have been detected as dissolved components in the groundwater and as vapor in the soil gas at several DOE sites, direct evidence of their presence as DNAPL is sparse and no measurements of the amounts of DNAPL present within a given volume of subsurface have been made. Consequently, unresolved DNAPL issues exist at DOE sites.

13098 (KFK–5168) **Characterisation of the biological nitrogen conversions in the unsaturated soil zone by means of the nitrous oxide formation.** Kiefer, C. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Radiochemie; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Chemie. Mar 1993. 76p. (In German). Order Number DE94747641. Source: OSTI; NTIS (US Sales Only).

Nitrification and denitrification play an important part in the nitrogen balance of soil. The importance of these biological processes in the upper soil layer is thoroughly examined. Focal point of this paper was, therefore, the examination of these processes in deeper soil zones. A fundamental object was the study of a low moor soil in a region of drinking water production and the answer to the question, whether its potential of denitrification was sufficiently high, to prevent effectively the transport of the high amount of nitrate, which was measured in the upper soil layer, to the ground water. The investigations were carried out by measuring the formation of nitrous oxide in soil sampes, thus avoiding their structure to be destroyed. The emission of the soil gases nitrous oxide and coarbon dioxide from a specially designed tube reactor containing the soil sample was measured simultaneously based on gaschromatographic analysis. The concentration of oxygen is adjustable, which is important for the determiantion of nitrifying or denitrifying characteristics of a soil sample. The apparatus was optimised in a way that it was possible to run it computer-controlled over a period of several weeks continuously. (orig./BBR)

13099 (LA–12721-PR) **Laboratory and field studies related to the Hydrologic Resources Management Program: Progress report, October 1, 1992–September 30, 1993.** Thompson, J.L. (comp.); Hawkins, W.L.; Mathews, M.; Henderson, R.W.; Thompson, J.L.; Maestas, S. Los Alamos National Lab., NM (United States). Jan 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94005331. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes research done at Los Alamos in FY 1993 for the Hydrologic Resources Management Program. The US Department of Energy funds this research through two programs at the Nevada Test Site (NTS): defense and groundwater characterization. Los Alamos personnel have continued to study the high-pressure zone created in the aquifer under Yucca Flat. We analyzed data from a hole in this area (U-7cd) and drilled another hole and installed a water monitoring tube at U-4t. We analyzed water from a number of locations on the NTS where we know there are radionuclides in the groundwater and critiqued the effectiveness of this monitoring effort. Our program for analyzing postshot debris continued with material from the last nuclear test in September 1992. We supported both the defense program and the groundwater characterization program by analyzing water samples

from their wells and by reviewing documents pertaining to future drilling. We helped develop the analytical methodology to be applied to water samples obtained in the environmental restoration and waste management efforts at the NTS. Los Alamos involvement in the Hydrologic Resources Management Program is reflected in the appended list of documents reviewed, presentations given, papers published, and meetings attended.

13100 (MLM–3791) **Mound facility physical characterization.** Tonne, W.R.; Alexander, B.M.; Cage, M.R.; Hase, E.H.; Schmidt, M.J.; Schneider, J.E.; Slusher, W.; Todd, J.E. Mound, Miamisburg, OH (United States). 1 Dec 1993. 355p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-88DP43495. Order Number DE94007754. Source: OSTI; NTIS; GPO Dep.

The purpose of this report is to provide a baseline physical characterization of Mound's facilities as of September 1993. The baseline characterizations are to be used in the development of long-term future use strategy development for the Mound site. This document describes the current missions and alternative future use scenarios for each building. Current mission descriptions cover facility capabilities, physical resources required to support operations, current safety envelope and current status of facilities. Future use scenarios identify potential alternative future uses, facility modifications required for likely use, facility modifications of other uses, changes to safety envelope for the likely use, cleanup criteria for each future use scenario, and disposition of surplus equipment. This Introductory Chapter includes an Executive Summary that contains narrative on the Functional Unit Material Condition, Current Facility Status, Listing of Buildings, Space Plans, Summary of Maintenance Program and Repair Backlog, Environmental Restoration, and Decontamination and Decommissioning Programs. Under Section B, Site Description, is a brief listing of the Site PS Development, as well as Current Utility Sources. Section C contains Site Assumptions. A Maintenance Program Overview, as well as Current Deficiencies, is contained within the Maintenance Program Chapter.

13101 (NEI-SE–143) **Project 'Agricultural research after Chernobyl'. Activity 1991-92.** Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology. Oct 1992. 6p. (In Swedish). Project SSI-P–658-91. Order Number DE94615814. Source: OSTI; NTIS; INIS.

The report describes the research performed 1991-92. The main fields have been: Radionuclide migration and transfer from soils to plants. Strontium and cesium analysis. Radioecology.

13102 (ORNL/TM–12626) **Mercury audit at Rocky Mountain Arsenal.** Smith, S.M. (Oak Ridge National Lab., TN (United States)); Jensen, M.K.; Anderson, G.M. Oak Ridge National Lab., TN (United States). Feb 1994. 47p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007197. Source: OSTI; NTIS; GPO Dep.

This report presents the results of an environmental compliance audit to identify potential mercury-containing equipment in 261 building and 197 tanks at the Rocky Mountain Arsenal (RMA). The RMA, located near Denver, Colorado, is undergoing clean up and decommissioning by the Department of the Army. Part of the decommissioning procedure is to ensure that all hazardous wastes are properly identified and disposed of. The purpose of the audit was to identify any mercury spills and mercury-containing instrumentation. The audit were conducted from April 7, 1992, through July 16, 1992, by a two-person team. The team interviewed personnel with knowledge of past uses of the buildings and tanks. Information concerning past mercury spills and the locations and types of instrumentation that contain mercury proved to be invaluable for an accurate survey of the arsenal. The team used a Jerome® 431-X™ Mercury Vapor Analyzer to detect spills and confirm locations of mercury vapor. Twelve detections were recorded during the audit and varied from visible mercury spills to slightly elevated readings in the corners of rooms with past spills. The audit also identified instrumentation that contained mercury. All data have been incorporated into a computerized data base that is compatible with the RMA data base.

13103 (PNL–8894) **Ecological evaluation of proposed dredged material from St. Andrew Bay, Florida.** Mayhew, H.L. (Battelle/Marine Sciences Lab., Sequim, WA (United States)); Word, J.Q.; Kohn, N.P.; Pinza, M.R.; Karle, L.M.; Ward, J.A. Pacific Northwest Lab., Richland, WA (United States); Battelle/Marine Sciences Lab., Sequim, WA (United States). Oct 1993. 399p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94001682. Source: OSTI; NTIS; INIS; GPO Dep.

The US Army Corps of Engineers (USACE), Mobile District, requested that the Battelle/Marine Sciences Laboratory (MSL) conduct field sampling and chemical and biological testing to determine the suitability of potential dredged material for open ocean disposal. Sediment from St. Andrew Bay was chemically characterized and evaluated for biological toxicity and bioaccumulation of contaminants. The Tier III guidance for ocean disposal testing requires tests of water column effects (following dredged material disposal), deposited sediment toxicity, and bioaccumulation of contaminants from deposited sediment (dredged material). To meet these requirements, the MSL conducted suspended-particulate-phase (SPP) toxicity tests, solid-phase toxicity tests, and bioaccumulation testing on sediment representing potential dredged material from Panama City Harbor. Physical and chemical characterization of sediment to support toxicity and bioaccumulation results was also conducted on both the test and reference sediments. The MSL collected sediment samples from five sites in St. Andrew Bay and one reference site near Lands End Peninsula. The five test sediments and the reference sediment were analyzed for physical and chemical sediment characteristics, SPP chemical contaminants, solid-phase toxicity, SPP toxicity, and bioaccumulation of contaminants.

13104 (PNL–8933) **Ecological evaluation of proposed dredged material from Oakland Harbor intensive study, IC-1 and OC4-B.** Pinza, M.R. (Battelle/Marine Sciences Lab., Sequim, WA (United States)); Mayhew, H.L.; Karle, L.M.; Word, J.Q. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 474p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94004320. Source: OSTI; NTIS; GPO Dep.

Oakland Harbor is located on the eastern shoreline of central San Francisco Bay in Alameda County, between the cities of Oakland and Alameda, California. Oakland Harbor and its access channels are no longer wide or deep enough to accommodate modern deeper-draft vessels. The Water Resources Development Act of 1986 (Public Law 99-662) authorized the US Army Corps of Engineers (USACE), San Francisco District to deepen and widen the navigation channels to −44 ft mean lower low water (MLLW) (−42 ft MLLW plus 2 ft of overdraft) in Oakland Harbor. Several options for disposal of the material from this dredging project are under consideration by USACE. Those options include disposal within San Francisco Bay, at open-ocean sites, or at upland disposal sites. Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), Public Law 92-532, specifies that all proposed disposal of dredged material into open water be evaluated to determine the potential environmental impacts to those activities. To comply with those requirements, the potential environmental impacts of the dredged material must be evaluated by chemical characterization, toxicity testing, and bioaccumulation testing prior to dredging and disposal. Test results are described.

13105 (PNL–9214) **Long-billed curlews on the Yakima Training Center: information for base realignment.** Hand, K.D.; Cadwell, L.L.; Eberhardt, L.E. Pacific Northwest Lab., Richland, WA (United States). Feb 1994. 58p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007982. Source: OSTI; NTIS; GPO Dep.

This report summarizes and discusses the results obtained during 1992 from the study of long-billed curlews on the Yakima Training Center (YTC), which Pacific Northwest Laboratory conducted for the US Department of the Army. This study was initiated to provide basic ecological information on YTC long-billed curlews (Numenius americanus). The long-billed curlew is a relatively common spring and summer resident on the YTC. However, other than

casual observations, very little is known about the distribution, density, reproductive success, and habitat requirements for this species on the YTC. Until recently the long-billed curlew was a US Fish and Wildlife Service candidate for listing as threatened or endangered; however, on November 21, 1991 it was down-listed to Class IIIc. The Washington Department of Wildlife lists the long-billed curlew as a "species of special concern." Specific objectives of this study were to (1) locate nesting areas, (2) locate brood-rearing areas, (3) evaluate habitat requirements, (4) determine diet, (5) evaluate response to troop activities, (6) evaluate the impact of livestock grazing, (7) estimate the population size, and (8) estimate recruitment rates. Six curlews (four females and two males) were captured and fitted with radio transmitters. These birds were relocated to obtain nesting, habitat use, and feeding information. Road surveys conducted over most of the YTC provided information on the bird's general distribution, habitat requirements, and nesting and brood-rearing areas.

13106 (PNL-SA–22991) **Pacific Northwest Laboratory's Solid Waste Initiative.** Holter, G.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9309301–1: Conference on addressing solid waste problems in the Pacific Northwest: working together to reach solutions, Richland, WA (United States), 23-24 Sep 1993). Order Number DE94004267. Source: OSTI; NTIS; INIS; GPO Dep.

In fiscal year 1992 (FY-92), a Solid Waste Initiative was undertaken within the Pacific Northwest Laboratory (PNL). This action was partly in response to a perceived increase in the frequency and severity of impacts associated with solid waste issues at all levels. It also recognized the limited attention of previous efforts in addressing the broader impacts resulting from solid waste and, thus, dealing with solid waste issues in a holistic fashion. This paper provides a description of the Solid Waste Initiative at PNL, including a historical perspective on PNL's involvement in solid waste issues, the goals and objectives of the Solid Waste Initiative, and a discussion of selected activities being conducted under the Initiative.

13107 (SCPRI-RM–04-1993) **Monthly results of measurements; April 1993.** Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France). 1993. 43p. (In French). Order Number DE94617769. Source: OSTI; NTIS (US Sales Only); INIS.

This report of the SCPRI exposes the principal results concerning the routine monitoring of environmental radioactivity in France: atmospheric dusts, rainwater, surface water, underground water, sewage water, drinking water, food chain (milk, vegetables, fishes), sea water around nuclear sites and other sites. The activities of various radioisotopes are presented in tables.

13108 (SKB-TR–93-15) **Analysis of the regional groundwater flow in the Finnsjoen area.** Boghammar, A. (Kemakta Konsult AB, Stockholm (Sweden)); Grundfelt, B.; Widen, H. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jun 1993. 60p. Order Number DE94615837. Source: OSTI; NTIS; INIS.

The present study on regional groundwater flow in the Finnsjoen area was performed by Kemakta Consultant Co, under contract from the Swedish Nuclear Fuel and Waste Management Company (SKB). The study was initiated by the discussions following the SKB 91 study. In the present report, the large scale regional groundwater flow situation in a vertical cross section through the Finnsjoen site is analysed using two-dimensional finite-element modelling assuming the rock can be described as a porous media. The analysis is focused on the effect of the position of the upstream lateral boundary and to what degree different fracture zone patterns influence the flow situation around the area that was used an an example repository site in SKB 91. It is of special interest to investigate if any of the chosen variations can result in an upward flow of water in the repository area with shorter groundwater travel times as a consequence. The potential effects of the following were studied:- three different sizes of the modelled domain: 43 km, 26 km and 18 km. - a number of different generic fracture zone patterns and a number of different combinations of rock matrix and fracture zone hydraulic conductivity. In all, 19 model cases were performed. The modelling was performed using the finite element code NAMMU together with the program package HYPAC for pre- and post processing. Topographical data for the region were taken from the SKB GIS database.

13109 (UCRL-ID–113521) **Interim report on verification and benchmark testing of the NUFT computer code.** Lee, K.H. (Lawrence Livermore National Lab., CA (United States)); Nitao, J.J.; Kulshrestha, A. Lawrence Livermore National Lab., CA (United States). Oct 1993. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94005650. Source: OSTI; NTIS; GPO Dep.

This interim report presents results of work completed in the ongoing verification and benchmark testing of the NUFT (Non-isothermal Unsaturated-saturated Flow and Transport) computer code. NUFT is a suite of multiphase, multicomponent models for numerical solution of thermal and isothermal flow and transport in porous media, with application to subsurface contaminant transport problems. The code simulates the coupled transport of heat, fluids, and chemical components, including volatile organic compounds. Grid systems may be cartesian or cylindrical, with one-, two-, or fully three-dimensional configurations possible. In this initial phase of testing, the NUFT code was used to solve seven one-dimensional unsaturated flow and heat transfer problems. Three verification and four benchmarking problems were solved. In the verification testing, excellent agreement was observed between NUFT results and the analytical or quasianalytical solutions. In the benchmark testing, results of code intercomparison were very satisfactory. From these testing results, it is concluded that the NUFT code is ready for application to field and laboratory problems similar to those addressed here. Multidimensional problems, including those dealing with chemical transport, will be addressed in a subsequent report.

13110 (UCRL-JC–115602) **Modeling groundwater flow on MPPs.** Ashby, S.F.; Falgout, R.D.; Smith, S.G.; Tompson, A.F.B. Lawrence Livermore National Lab., CA (United States). Oct 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310220–5: Institute of Electrical and Electronic Engineers (IEEE) meeting on scalable parallel libraries, Starkville, MS (United States), 6-8 Oct 1993). Order Number DE94006663. Source: OSTI; NTIS; INIS; GPO Dep.

The numerical simulation of groundwater flow in three-dimensional heterogeneous porous media is examined. To enable detailed modeling of large contaminated sites, preconditioned iterative methods and massively parallel computing power are combined in a simulator called PARFLOW. After describing this portable and modular code, some numerical results are given, including one that demonstrates the code's scalability.

13111 (WHC-EP–0394-7) **Groundwater maps of the Hanford Site, June 1993.** Kasza, G.L.; Hartman, M.J.; Jordan, W.A.; Weekes, D.C. Westinghouse Hanford Co., Richland, WA (United States). Feb 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007149. Source: OSTI; NTIS; INIS; GPO Dep.

The Groundwater Maps of the Hanford Site, June 1993 is an update of the series of reports that document the configuration of the uppermost unconfined aquifer beneath the Hanford Site. This report series presents the semiannual water level measurements taken at site groundwater monitoring wells each June and December and the groundwater maps derived from these measurements. These reports document the changes in the groundwater level at Hanford as the site has transitioned from nuclear material production to environmental restoration and remediation. In addition, these reports provide water level data to support the various site characterization and groundwater monitoring programs currently in progress on the Hanford Site. Groundwater Maps of the Hanford Site are prepared for the US Department of Energy, Office of Environmental Restoration and Waste Management, by the Hanford Site Operations and Engineering Contractor, Westinghouse Hanford Company (WHC). This document fulfills reporting requirements specified in WHC (1993), Section 8.0 "Water Quality" and also described in the Environmental Monitoring Plan for the Hanford Site (DOE-RL 1991). Maps depicting the water table beneath the Hanford Site south of the Columbia River are presented in this report. Appendix A lists the well identification number, depth to water, casing elevating and the water level elevation for each well measured

during June 1993. A summary discussion of the data is included with a well index map, the depth to water map and the contoured map of the water table surface for the Hanford Site and each of the three operational areas (the 100, 200, and 300-1100 Areas).

13112 (WHC-SD-EN-TI-219) **Data validation report for the 100-HR-3 Operable Unit, fifth round groundwater samples.** Vukelich, S.E. (Kearney (A.T.), Inc., Chicago, IL (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kearney (A.T.), Inc., Chicago, IL (United States). 20 Jan 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94007148. Source: OSTI; NTIS; INIS; GPO Dep.

The data from the chemical analysis of 68 samples from the 100-HR-3 Operable Unit Third Quarter 1993 Groundwater Sampling Investigation and their related quality assurance samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at the site. Sample analysis included inorganics and general chemical parameters. Fifty three samples were validated for radiochemical parameters.

13113 (WHC-SD-EN-TP-039) **Integrated test plan for crosswell compressional and shear wave seismic tomography for site characterization at the VOC Arid Site.** Elbring, G.J.; Narbutovskih, S.M. Westinghouse Hanford Co., Richland, WA (United States). 1 Feb 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94006995. Source: OSTI; NTIS; INIS; GPO Dep.

This integrated test plan describes the demonstration of the crosswell acoustic tomography technique as part of the Volatile Organic Compounds-Arid Integrated Demonstration (VOC-Arid ID). The purpose of this demonstration is to image the subsurface seismic velocity structure and to relate the resulting velocity model to lithology and saturation. In fiscal year (FY) 1994 an initial fielding will test three different downhole sources at two different sites at the Hanford US Department of Energy facility to identify which sources will provide the energy required to propagate between existing steel-cased wells at these two sites. Once this has been established, a second fielding will perform a full compressional and shear wave tomographic survey at the most favorable site. Data reduction, analysis, and interpretation of this full data set will be completed by the end of this fiscal year. Data collection for a second survey will be completed by the end of the fiscal year, and data reduction for this data set will be completed in FY 1995. The specific need is detailed subsurface characterization with minimum intrusion. This technique also has applications for long term vadose zone monitoring for both Resource Conservation and Recovery Act (RCRA) waste storage facilities and for remediation monitoring. Images produced are continuous between boreholes. This is a significant improvement over the single point data derived solely from core information. Saturation changes, either naturally occurring (e.g., perched water tables) or remediation induced (e.g., water table mounding from injection wells or during inwell air sparging) could be imaged. These crosswell data allow optimal borehole placement for groundwater remediation, associated monitoring wells and possibly evaluation of the effective influence of a particular remediation technique.

13114 (WSRC-TR-93-496) **SRS ecology: Environmental information document.** Wike, L.D. (and others); Shipley, R.W.; Bowers, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1993. 986p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94005644. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Document is to provide a source of ecological information based on the exiting knowledge gained from research conducted at the Savannah River Site. This document provides a summary and synthesis of ecological research in the three main ecosystem types found at SRS and information on the threatened and endangered species residing there.

13115 (WSRC-TR-93-526) **Results of the fourth quarter tritium survey of the F- and H-Area seepiines: March–April 1993.** Dixon, K.L.; Rogers, V.A. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94005518. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Sciences Section (ESS) established a quarterly monitoring program of the Four Mile Creek seepline down gradient from the F- and H-Area seepage basins. The program surveys and tracks changes in tritium, specific conductivity, and pH for the seepline water. Measurements from the fourth quarter survey (March/April 1993) showed lower tritium and conductivity measurements and higher pH values (pH 5–6) than measurements from previous studies. The results of the first four quarterly surveys suggest that infiltration of rainfall may be diluting and flushing the contaminants from the groundwater system. More measurements are needed to confirm these trends.

13116 (WSRC-TR-93-563) **The direct sampling ion trap mass spectrometer for the rapid analysis of volatile organic contaminants in groundwater samples.** Eddy-Dilek, C.A.; Rossabi, J.; Keenan, M.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94008226. Source: OSTI; NTIS; GPO Dep.

Analytical results of volatile organic contaminant (VOC) concentrations in groundwater samples from A/M Area obtained using a direct sampling ion trap mass spectrometer (DSITMS) and a gas chromatograph (GC) with an electron capture detector (ECD) were comparable. Replicate water samples were collected at the Integrated Demonstration Site during four bi-weekly sampling periods and analyzed by both instruments. The calibration curves prepared for both the DSITMS and GC-ECD are essentially linear over the concentration range analyzed. The advantage of the DSITMS over the GC-ECD method is the rapid sample analysis time of the DSITMS. In order to validate the technology for use in the sample minimization efforts at SRS, duplicate groundwater samples from selected compliance wells were analyzed by DSITMS and GC-ECD. The DSITMS is appropriate to use for field screening water samples before offsite analysis. These analytical results will be compared with results from offsite labs contracted to perform contract lab program (CLP) analyses of regulatory samples when these analyses are available.

13117 (WSRC-TR-93-568) **F- and H-Area Sewage Sludge Application Sites Groundwater Monitoring Report: Third quarter 1993.** Westinghouse Savannah River Co., Aiken, SC (United States). Jan 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007194. Source: OSTI; NTIS; GPO Dep.

Samples from the four wells at the F-Area Sewage Sludge Application Site (FSS wells) and the three wells at the H-Area Sewage Sludge Application Site (HSS wells) are analyzed quarterly for constituents as required by South Carolina Department of Health and Environmental Control Construction Permit 12,076 and, as requested, for other constituents as part of the Savannah River Site Groundwater Monitoring Program. Annual analyses for other constituents, primarily metals, also are required by the permit. Currently, iron, lead, and manganese are the only permit-required analytes that exceed standards at the F- and H-Area Sewage Sludge Application Sites. Tritium and aluminum are the nonpermit constituents exceeding standards. Other constituents have exceeded standards at this site previously, but only sporadically.

13118 (WSRC-TR-93-569) **K-Area and Par Pond Sewage Sludge Application Sites Groundwater Monitoring Report: Third quarter 1993.** Westinghouse Savannah River Co., Aiken, SC (United States). Jan 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007193. Source: OSTI; NTIS; GPO Dep.

Samples from the three wells at the K-Area Sewage Sludge Application Site (KSS wells) and the three wells at the Par Pond Sewage Sludge Application Site (PSS wells) are analyzed quarterly for constituents required by South Carolina Department of Health and Environmental Control Construction Permit 13,173 and, as requested, for other constituents as part of the Savannah River Site (SRS) Groundwater Monitoring Program. Annual analyses for other constituents, primarily metals, also are required by the permit. Iron and lead, permit-required constituents, and aluminum presently

exceed SRS flagging standards in samples from the two sites. Elevated concentrations of metals at these sites, not reported during 1992, may be the reflection of a recent change in analytical methodology.

13119 (WSRC-TR–93-574) **Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Third quarter 1993.** Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1993. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007280. Source: OSTI; NTIS; INIS; GPO Dep.

During third quarter 1993, samples from AMB groundwater monitoring wells at the Metallurgical Laboratory Hazardous Waste Management Facility were analyzed for certain heavy metals, indicator parameters, radionuclides, volatile organic compounds, and other constituents. Eight parameters exceeded standards during the quarter. As in previous quarters, tetrachloroethylene and trichloroethylene exceeded final Primary Drinking Water Standards; and aluminum, iron, lead, manganese, pH, and total organic halogens exceeded the Savannah River Site Flag 2 criteria in one or more of the wells. Groundwater flow direction and rate in the water-table unit were similar to previous quarters.

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Refer also to citation(s) 11492, 11574, 11695, 11732, 11801, 11809, 11810, 11936, 11939, 12105, 12106, 12192, 12440, 12685, 13033, 13064, 13077, 13081, 13095, 13103, 13104, 13107, 13109, 13114

13120 (CEA-CONF–11643) **Chemical evolution of deep groundwaters in granites, information acquired from natural systems.** Toulhoat, P. (CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets); Beaucaire, C.; Michard, G.; Ouzounian, G. CEA Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. Stockage Dechets. 1993. 13p. (CONF-9311183–: Workshop on Paleohydrogeological Methods and their Applications for Radioactive Waste, Paris (France), 9-10 Nov 1993). Order Number DE94617788. Source: OSTI; NTIS (US Sales Only); INIS.

A research program has been carried out for five years, concerning a major aspect of deep radioactive waste disposals: groundwaters in the host-rock. The following items have been examined: the exact composition of confined waters, excluding those which are found in highly conductive (even deep) fractures; evolution path from surface waters to confined waters; possible influence of the repository on the composition of groundwaters; possible influence of groundwaters on the elements which could escape the repository (major elements, trace elements, radioactive elements). The following methodology is used: groundwater sampling and analysis, identification of the major phenomena controlling element concentration in groundwaters, modelling, modelling validation. (author). 11 refs., 4 figs., 3 tabs.

13121 (DOE-RAS–93.004) **Radiological assessment of private water supplies in Berwick-upon-Tweed, England.** Green, D.; McReddie, R.; Holland, B. ICI Tracerco, Billingham (United Kingdom). 1993. 74p. Sponsored by Department of the Environment, London (United Kingdom). Radioactive Substances Div. Contract PECD-7/9/539; DG-LF-1642. Order Number DE94617786. Source: OSTI; NTIS (US Sales Only); INIS.

Water samples from 95 private water supplies and 5 main supplies in the Berwick-Upon-Tweed area of England have been analysed for natural and artificial radionuclides and the elements Calcium and Strontium. In addition 20 of the 100 supplies were specifically sampled for the measurement of Radon-222. Of the 100 supplies tested, all total alpha and beta values were within the WHO guideline values. An assessment of the radiological significance of the analytical data has been carried out by calculating the committed effective dose equivalent to a hypothetical "Critical" group which would arise from the consumption of water during a single year. The maximum infant annual committed effective dose equivalent for artificial and total radionuclides measured during this programme of monitoring was found to be 0.5 μSv and 2290μSv respectively. (Author).

13122 (ES/ER/TM–96) **Toxicological benchmarks for screening of potential contaminants of concern for effects on aquatic biota on the Oak Ridge Reservation, Oak Ridge, Tennessee: Environmental Restoration Program ESD Publication 3940.** Sutter, G.A. II (Oak Ridge National Lab., TN (United States)); Futrell, M.A.; Kerchner, G.A. Oak Ridge National Lab., TN (United States). Sep 1992. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94006320. Source: OSTI; NTIS; GPO Dep.

This report presents potential screening benchmarks for protection of aquatic life from contaminants in water. Because there is no guidance for screening benchmarks, a set of alternative benchmarks is presented here. The alternative benchmarks are based on different conceptual approaches to estimating concentrations causing significant effects. For the upper screening benchmark, they are the acute National Ambient Water Quality Criterion (NAWQC) and the acute pesticide advisory value (a concentration that is estimated with 95% confidence not to exceed the unknown acute NAWQC for those chemicals with no NAWQC). The alternative chronic benchmarks are the chronic NAWQC, the chronic pesticide screening value, the lowest chronic values for fish and daphnids, the lowest concentration that produces a response in 20% of fish and daphnids [effective concentration 20 (EC_{20})] as established through chronic toxicity tests, the estimated EC_{20} for a sensitive species, and the concentration estimated to cause a 20% reduction in the recruit abundance of largemouth bass. It is recommended that ambient chemical concentrations be compared to all of these benchmarks. To the extent that toxicity data are available, this report presents the alternative benchmarks for chemicals that have been detected on the Oak Ridge Reservation. It also presents the data used to calculate the benchmarks, and the sources of the data. It compares the benchmarks and discusses their relative conservatism and utility.

13123 (HAN–89378) **Minutes of the meeting between Richland Operations Office and United States Public Health Service on Columbia River contamination at Richland, Washington on July 16, 1964.** General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. [1964]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007879. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This paper contains the minutes of a meeting on Columbia River contamination at Richland, Washington, held on July 16, 1964. The US Public Health Service sponsored the meeting and representatives from the following organizations were present: Washington State Pollution Control, Washington State Department of Health, Richlands Operations Office, AEC Headquarters, and General Electric Company. The meeting dealt with reducing the amount of effluent contributed to the Columbia River, the amount of reduction achievable, the costs involved and the status of technical feasibility studies. This document was declassified on January 26, 1994.

13124 (HW–75958-RD) **Selected radioisotopes' concentrations in integrated reactor effluent water samples.** Jackson, P.O. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. Dec 1962. 265p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007890. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This document contains the results of weekly sampling of various isotope concentrations from effluent water at the 100 area at Hanford from July 1962 to February 1965. Compiled data in microcuries/milliliter are given. Each sampling records the concentrations of iodine-131, phosphorus-32, zinc-65, scandium-46, chromium-51, and cobalt-60. Records prior to October 8, 1962 also contain information on strontium-90, cesium-137, zirconium-95, ruthenium-103, ruthenium-106, and strontium-89. These last records are all from F reactor samples.

13125 (INIS-BR–3238) **Hydrogeologic study of the radioactive waste disposal of Abadia de Goias, Goiania-GO.** Pessoa, P.F.P. (Companhia de Pesquisas de Recursos Minerais, Belo Horizonte, MG (Brazil)). Associacao Brasileira de Recursos Hidricos, Rio de Janeiro, RJ (Brazil). 1993. 10p. (In Portuguese). (CONF-9311174–: 10. Brazilian Symposium on Hydric Resources; 1.

Symposium on Hydric Resources of Cone Sul, Gramado (Brazil), 7-12 Nov 1993). Order Number DE94615844. Source: OSTI; NTIS (US Sales Only); INIS.

This study concerns with the results of hydrogeological evaluation of the area near Abadia de Goias district, Goiania, Brazil where 3.500 tons of radioactive waste of Cesium-137 will be buried. These results were obtained from several field tests and represent the pumping well data of the unconfined aquifer plus the water level seasonal variations from the observation wells. The piezometers grid was constructed to provide a more detailed information on the water movement along a two dimension surface. Samples were collected from bore holes and sent to laboratory for granulometric analysis. Field investigation and air photograph interpretation evidenced all drainage patterns what simplifies the understanding of morphological and structural relations. (author).

13126 (INIS-BR–3282) **Evaluation of the Madeira River and its tributaries by stable isotopes.** Mortatti, J. (Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil)); Matsui, E.; Martinelli, L.A.; Victoria, R.L.; Ferreira, J.R. Mato Grosso Univ., Cuiaba, MT (Brazil). 1988. 1p. (In Portuguese). (CONF-8807221–: 2. Brazilian Congress on Limnology, Cuiaba (Brazil), 24-28 Jul 1988). Order Number DE94620606. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RIVERS/isotope ratio; RIVERS/seasonal variations; COMPARATIVE EVALUATIONS; DEUTERIUM; NATURAL OCCURRENCE; OXYGEN 18; RAIN WATER; RIVERS; SEASONS; STEAM; WATER QUALITY

13127 (INIS-mf–13797) **Technogenic and Natural Radionuclides in the Black Sea bottom Sediments.** Strezov, A.S.; Milanov, M.; Mishev, P.; Stoilova, T. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 6p. (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94617787. Source: OSTI; NTIS (US Sales Only); INIS.

The investigation is a part of the long-term programme: 'Marine Radioecology - Impact of Hazardous Radionuclides on Marine Ecosystems'. The radionuclide content in sea sediments is measured. The method applied is low-level gamma spectrometry analysis using a high purity Ge-detector. The sampling is performed by scuba divers who selected a sample site of an equal particle size, depth and distance from the shore. The analysis of the vertical distribution of Cs-134 and Cs-137 shows that radionuclides from Chernobyl origin are present only in the surface layer. Both the technogeneous and natural radionuclides display seasonal variations. The data collected from the main sea resorts and the main dwelling places along the Bulgarian Black sea coast show that radionuclides concentration strongly depends on the nature of the sea bed sediments. The data for sandy sediments fall within close range while clay and slime sediments vary in much greater extent. The technogeneous radionuclides have a clear tendency to higher values in the North region showing the contribution of the big rivers entering the Black sea from the North. The values of K-40 fall in the range 10-1500 Bq/kg in the bottom sediments and around 6 Bq/l in the water samples. The calculated average ratio $^{137}Cs/^{134}Cs$ correspond to the value measured in May 1986 which is a proof for the Chernobyl origin of these radionuclides. A conclusion is drawn that technogeneous radionuclides are born mainly by the sea streams and natural radionuclides also follow the same tendency. (M.A.).

13128 (LA-UR–94-521) **Radionuclide concentrations in game (surface feeders) and nongame (bottom feeders) fish upstream and downstream of Los Alamos National Laboratory.** Fresquez, P.R.; Armstrong, D.R.; Salazar, J.G. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404107–1: New Mexico conference on the environment, Albuquerque, NM (United States), 24-26 Apr 1994). Order Number DE94007547. Source: OSTI; NTIS; GPO Dep.

This paper summarizes radionuclide concentrations in game (surface feeders) and nongame (bottom feeders) fish collected from reservoirs upstream (Abiquiu, Heron and/or El Vado) and downstream (Cochiti) of Los Alamos National Laboratory from 1981 to 1992. Sr-90, Cs-137, Pu- 238, and Pu-239 were not significantly different in either game or nongame fish collected from Cochiti reservoir as compared to fish collected from reservoirs upstream of the Laboratory. Total uranium was the only radionuclide that was found to be significantly different in both game and nongame fish collected from Cochiti as compared to fish collected from Abiquiu, Heron and El Vado. Uranium concentrations in fish collected from Cochiti, however, significantly decrease from 1981 to 1992, and no evidence of depleted uranium was found. Based on the average concentration of radionuclides over the years, the effective (radiation) dose equivalent from consuming 21 kg of game fish and nongame fish from Cochiti reservoir was 0.005 and 0.009 mrem/yr, respectively. This is <0.01% of the International Commission on Radiological Protection (ICRP) permissible dose limit for protecting members of the public.

13129 (NIRS-M–93, pp. 23-31) **Concentration of technetium-99 in marine environment.** Hirano, Shigeki (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Seawater and brown algae have been collected along the coast of Ibaraki Prefecture. Technetium-99 was preconcentrated from seawater by anion exchange resin, Bio-rad AG1-X8, C1-form, 50-100 mesh, and was extracted by 30% tri-n-octylamine (TOA):xylene solution, followed by back-extraction with 5M NaOH solution. Technetium-99 was re-extracted into 2-butanone which was removed by rotary evaporator. The residue was dissolved by diluted sulfuric acid solution, in which 20 mg of cupric ion was added. Technetium-99 was co-precipitated with cupric ion carrier as TcS by adding a thioacetoamide solution. Algae were dried and ignited in an electric furnace at 450degC for 36h. The ash were digested with 4N nitric acid solution on a hot plate to leach technetium-99 into the nitric acid solution. The solution was centrifuged and the supernatant was processed by liquid extraction with 30 % TOA-xylene solution as in the analysis of seawater. Among several species of brown algae, the highest concentration of technetium-99 was obtained in Sargassum thunbergii, which was found to be a useful indicator of technetium-99 in marine environment. (author).

13130 (NIRS-RSD–100) **Radioactivity survey data in Japan, part 1: Environmental materials.** National Inst. of Radiological Sciences, Chiba (Japan). Jun 1993. 32p. Order Number DE94748690. Source: OSTI; NTIS; INIS.

The publication is aimed at providing radioactivity survey data in Japan. Part 1 covered environmental materials, including rain, dry fallout, airborne dust, service water, freshwater, soil, and sea sediments. Samples were collected from 42 locations during the period between April 1991 and April 1992, and were sent to the Japan Chemical Analysis Center for radiochemical analysis. Strontium-90 and cesium-137 in these environmental materials are tabulated. The maximum concentrations of strontium-90 and cesium-137 were 0.40 ± 0.035 MBq/Km^2 and 0.22 ± 0.031 MBq/Km^2, in rain and dry fallout; 0.0018 ± 0.00075 mBq/m^3 and 0.0011 ± 0.00066 mBq/m^3 in airborne dust; 5.5 ± 0.28 mBq/l and 0.42 ± 0.11 mBq/l in service water; 3.5 ± 0.22 mBq/l and 0.33 ± 0.10 mBq/l in freshwater; 1100 ± 30 MBq/Km^2 and 3500 ± 70 MBq/Km^2 in soil; 0.34 ± 0.093 Bq/kg and 7.2 ± 0.29 Bq/kg in sea sediments respectively. Annual changes in the concentrations of both strontium-90 and cesium-137 from 1988 through 1992 are given in figures. (J.P.N.).

55 BIOMEDICAL SCIENCES, BASIC STUDIES

Refer also to citation(s) 12749, 12825, 13029, 13146

5501 Behavioral Biology

Refer also to citation(s) 11937, 11938

13131 (DOE/BP–1979) **Columbia River Basin Fish and Wildlife Program Annual Implementation Work Plan for fiscal year 1993.** USDOE Bonneville Power Administration, Portland, OR (United States). Div. of Fish and Wildlife. Sep 1992. 325p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007589. Source: OSTI; NTIS; GPO Dep.

The Columbia River Basin Fish and Wildlife Program (Program) was developed by the Northwest Power Planning Council (Council) in accordance with Public Law 96-501, the Pacific Northwest Electric Power Planning and Conservation Act (Act). The purpose of the Program is to guide the Bonneville Power Administration (BPA) and other Federal agencies in carrying out their responsibilities to protect, mitigate, and enhance fish and wildlife of the Columbia River Basin. The Annual Implementation World Plan (AIWP) presents BPA's plans for implementing the Program during fiscal year (FY) 1993. The FY 1993 AIWP emphasizes continuation of 143 ongoing or projecting ongoing Program projects, tasks, or task orders, most of which involve protection, mitigation, or enhancement of anadromous fishery resources. The FY 1993 AIWP also contains three new Program projects or tasks that are planned to start in FY 1993.

13132 (DOE/BP/02886–1) **Breeding plan to preserve the genetic variability of the Kootenai River white sturgeon: Final report.** Kincaid, H.L. National Fishery Research and Development Lab., Wellsboro, PA (United States). Dec 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI79-93BP02886. Order Number DE94006090. Source: OSTI; NTIS; GPO Dep.

Natural reproduction in the Kootenai River white sturgeon population has not produced a successful year class since 1974, resulting in a declining broodstock and 20 consecutive year classes missing from the age-class structure. This report describes a captive breeding plan designed to preserve the remaining genetic variability and to begin rebuilding the natural age class structure. The captive breeding program will use 3–9 females and an equal number of males captured from the Kootenai River each spring. Fish will be spawned in pairs or in diallel mating designs to produce individual families that will be reared separately to maintain family identity. Fish will be marked to identify family and year class before return to the river. Fish should be returned to the river as fall fingerlings to minimize potential adaptation to the hatchery environment Initially, while tagging methods are tested to ensure positive identification after return to the river, it may be necessary to plant fish as spring yearlings. Number of fish planted will be equalized at 5,000 per family if fall fingerlings or 1,000 per family if spring yearlings. Assuming annual survival rates of 20% during the first winter for fall fingerling plants and 50% for years 1–3, and 85% for years 4–20 of all fish planted, the target numbers would yield 7.9 progeny per family or about 4 breeding pairs at age 20. Natural survival in the river environment during the 19+ years from planting to maturity would result in variability in genetic contribution of families to the next broodstock generation. Fish planted per family would be adjusted in future years when actual survival rate information is known. Broodfish will be tagged when captured to minimize multiple spawning of the same fish. implementation of this breeding plan each year for the 20-year generation interval, using 5 different mating pairs each year, will yield an effective population size of 200, or 22.5% of the estimated 1990 population.

13133 (DOE/BP–91819-5) **Measurement of thyroxine concentration as an indicator of the critical period for imprinting in kokanee salmon (Oncorhynchus nerka): Implications for operating Lake Roosevelt kokanee hatcheries: Supplement: Lake Roosevelt Monitoring Program – 1991 annual report.** Scholz, A.T.; White, R.J.; Koehler, V.A.; Horton, S.A. Eastern Washington Univ., Chaney, WA (United States). Upper Columbia United Tribes Fisheries Research Center. May 1992. 103p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract BI79-88BP91819. Order Number DE94007586. Source: OSTI; NTIS; GPO Dep.

Previous investigations have determined that thyroid hormone surges activate olfactory imprinting in anadromous salmonid smolts. The mechanism of action appears to require binding of thyroid hormones to receptors in brain cell nuclei, which stimulates neuron differentiation and wires a pattern of neuron circuitry that allows for the permanent storage of the imprinted olfactory memory. In this study, thyroxine concentrations [T_4] were measured in 487 Lake Whatcom stock and 70 Lake Roosevelt stock Kokanee salmon to indicate the critical period for imprinting. Eggs, alevins and fry, reared at the Spokane Indian Kokanee Hatchery, were collected from January through August 1991. Sampled fish were flash frozen on dry ice and stored at −80°C until T_4 was extracted and concentrations determined by radioimmunassay. Mean concentration ± SEM of 10–20 individual fish (assayed in duplicate) were determined for each time period. T_4 concentration peaked on the day of hatch at 16.8 ng/g body weight and again at swim-up at 16.0 ± 4.7 ng/g body weight. T_4 concentration was 12.5 to 12.9 ng/g body weight in eggs, 7.1 to 15.2 ng/g body weight in. alevins, 4.5 to 11.4 ng/g body weight in 42 to 105 day old fry and 0.1 to 2.9 ng/g body weight in 112 to 185 day old fry. T_4 concentrations were highest in eggs at 13.3 ± 2.8 ng/g body weight, then steadily decreased to 0.1 ± 0.1 ng/g body weight in older fry. Fry were released in Lake Roosevelt tributaries in July and August 1991, at about 170–180 days post hatching, in order to imprint them to those sites. The results of this study indicate that the time of release was not appropriate for imprinting. If T_4 levels are an accurate guide for imprinting in kokanee, our results suggest that the critical period for imprinting in kokanee is at hatching or swim-up stages.

13134 (LA-UR–93-4412) **The behavior-genetics debate in the United States.** Yesley, M.S. Los Alamos National Lab., NM (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311166–1: 3. bioethics seminar, Fukui (Japan), 14 Nov 1993). Order Number DE94005094. Source: OSTI; NTIS; GPO Dep.

This paper, submitted to the Third Bioethics Seminar in Fukai, Japan, presents information on program activities and discusses primary topics concerning genetic factors in behavior. Proponents and critics views on genetic explanations of antisocial behavior are discussed.

5502 Biochemistry

Refer also to citation(s) 11897, 11898, 11899, 12935, 13105, 13152, 13153, 13154

13135 (ANL/BIM/PP–73287) **Rearrangement of RAG-1 recombinase gene in DNA-repair deficient "wasted" mice.** Woloschak, G.E. (Loyola Univ., Chicago, IL (United States)); Libertin, C.R.; Weaver, P.; Churchill, M.; Chang-Liu, C.M. Argonne National Lab., IL (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94003222. Source: OSTI; NTIS; GPO Dep.

Mice recessive for the autosomal gene "wasted" wst display a disease pattern which includes increased sensitivity to the killing effects of ionizing radiation, immunodeficiency, and neurologic dysfunction. The recent cloning and characterization of recombinase genes (RAG-I/RAG-2) expressed in lymphoid and possibly central nervous system tissues prompted us to examine expression of these genes in DNA repair-deficient/immunodeficient wasted mice. Our results revealed expression of RAG-1 mRNA in spinal cord (but not brain) of control mice; no expression of RAG-1 mRNA was detected in spinal cord or brain from wst/wst mice or their normal littermates (wst/·mice). In thymus tissue, a small RAG-1 transcript (1.0 kb) was detected in wst/wst mice that was not evident in thymus from control mice. In wst/·mice, a two-fold increase in RAG-1 mRNA was evident in thymus tissue. RAG-2 mRNA could only be detected in thymus tissue from wst/· and not from wst/wst or parental control BCF_1 mice. Southern blots revealed a rearrangement/deletion within the RAG-1 gene of affected wasted mice, not evident in known strain-specific parental or littermate controls. These results support the idea that the RAG-1 gene may map at or near the locus for the wasted mutation. In addition, they suggest the importance of recombinase function in normal immune and central nervous system development as well as the potential contribution of this gene family to the normal repair of radiation-induced DNA damage.

13136 (CONF-940340–1) **Protein structure prediction using hybrid AI methods.** Guan, X.; Mural, R.J.; Uberbacher, E.C. Oak Ridge National Lab., TN (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 10. Institute of Electrical and Electronic Engineers (IEEE) conference on artificial intelligence for applications; San Antonio, TX (United States); 1-4 Mar 1994. Order Number DE94002443. Source: OSTI; NTIS; GPO Dep.

This paper describes a new approach for predicting protein structures based on Artificial Intelligence methods and genetic algorithms. We combine nearest neighbor searching algorithms, neural networks, heuristic rules and genetic algorithms to form an integrated system to predict protein structures from their primary amino acid sequences. First we describe our methods and how they are integrated, and then apply our methods to several protein sequences. The results are very close to the real structures obtained by crystallography. Parallel genetic algorithms are also implemented.

13137 (DOE/ER/13496–T1) **The structure of pectins from cotton suspension culture cell walls: Progress report.** Mort, A.J. Oklahoma State Univ., Stillwater, OK (United States). [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-86ER13496. Order Number DE94002246. Source: OSTI; NTIS; GPO Dep.

This report, submitted by the Department of Biochemistry and Molecular Biology at Oklahoma State University, describes progress on determining the structure of pectins in cotton suspension culture cell walls.

13138 (DOE/ER/13869–5) **[Regulation of terpene metabolism]: Progress report, [March 15, 1993–March 14, 1994].** Croteau, R. Washington State Univ., Pullman, WA (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-88ER13869. Order Number DE94007952. Source: OSTI; NTIS; GPO Dep.

Many lines of evidence suggest that the cyclases ((+)–bornyl pyrophosphate cyclases and (–)–limonene cyclases) catalyze the rate-limiting steps of monoterpene biosynthesis in sage and mint, respectively. Similar evidence indicates that camphor hydroxylase, and the reductases that control the disposition of methone, are the critical steps of monoterpene catabolism in these systems. Related studies, based on in vitro assay of enzyme activities, have suggested that the accumulation and the compartmentation of these processes. Further studies directed toward localizing the pathways and determining the relevant protein and transcript levels require pure enzymes for antibody preparation and amino determining the relevant protein and transcript levels require pure enzymes for antibody preparation and amino acid sequence determination.

13139 (DOE/ER/14114–3) **Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, August 1, 1992–July 30, 1993.** Belfort, G.; Koehler, J.; Wood, J. Rensselaer Polytechnic Inst., Troy, NY (United States). Dept. of Chemical Engineering. 15 Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14114. Order Number DE94006987. Source: OSTI; NTIS; GPO Dep.

The Surface Force Apparatus is now operable; data collection is automatic. Hen egg lysozyme was chosen as model protein. Protein-protein, protein-mica, protein-polymer, and protein-surfactant interactions were studied. Circular dichroism was used to study changes in protein structure during adsorption.

13140 (DOE/ER/20039–T1) **[Genetic engineering with a gene encoding a soybean storage protein to identify DNA sequences to control its expression]: Annual report, 1993.** Beachy, R.N. Research Inst. of Scripps Clinic, La Jolla, CA (United States). Dept. of Cell Biology. 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-91ER20039. Order Number DE94008360. Source: OSTI; NTIS; GPO Dep.

The β-conglycinins are soybean storage proteins encoded by genes that are tightly regulated both spatially and temporally. The author has studied the Soybean Embryo Factors that bind to the cis elements that are presumably involved in regulating the expression of these gene promoters using both in vitro binding assays and in vivo expression assays in transgenic plants. The results obtained to date have made it evident that there are no clear correlations between the in vivo and the in vitro results, i.e., changes in single nucleotides that alter protein:DNA interactions can have little or no impact on expression of the promoters in vivo. In contrast, the CATGCAT (RY element) sequence, for which no binding proteins have been identified, appear to be very important for controlling gene expression. Although the author has been attempting to isolate and characterize the SEF 3 and SEF 4 proteins he has to date not been successful using protein expression libraries derived from embryo cDNAs. He is continuing experiments of this type, as well as more standard protein purification procedures. He has constructed a number of chimeric promoters with different upstream and downstream regulatory sequences in an attempt to identify, by expression assays in transgenic plants, those sequences that are uniquely responsible for the temporal and spatially regulated expression of the β-conglycinin genes. Because of the results of previously published work from this laboratory, the author concluded that the core promoters themselves may be responsible for the regulation. Therefore, he has focused his efforts on these sequences, the RY element, and the SEF 3 binding sequences. In a follow-up to the studies to modify the expression of genes in seeds, he will express several types of human and other animal genes in seeds of transgenic plants.

13141 (DOE/ER/60621–T1) **Main research accomplishments since the grant was last reviewed competitively: [Final technical progress report, November 1, 1992–July 31, 1993].** Prakash, L. Rochester Univ., NY (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER60621. Order Number DE94002595. Source: OSTI; NTIS; GPO Dep.

This project deals with the characterization of DNA repair genes and their encoded proteins involved in the incision step of excision repair and in postreplication repair and mutagenesis following exposure to UV light in eukaryotes: the yeast Saccharomyces cerevisiae and humans. Summarized in this report is progress in achieving the goals of this project.

13142 (DOE/ER/60985–3) **The separation of DNA by pulsed field capillary electrophoresis: Progress report, August 1, 1992–December 31, 1993.** Karger, B.L. Northeastern Univ., Boston, MA (United States). Barnett Inst. of Chemical Analysis and Materials Science. Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER60985. Order Number DE94007001. Source: OSTI; NTIS; GPO Dep.

This work has led to well-defined and rugged systems for the rapid separation of double stranded DNA fragments up to roughly 23,000 bp. Larger fragments than this require alternate procedures of injection and running of the electrophoretic system. Up to roughly 1000 bp, ultra-high resolution is possible, including single base pair resolution up to roughly 400 bases in size. Such ultra-high resolution provides powerful means of identification of DNA fragments and ultimately of purification of fragments. This work has provided a good foundation for our studies on DNA sequencing utilizing primer walking techniques.

13143 (DOE/ER/61127–3) **Time-of-flight mass spectrometry of DNA for rapid sequence determination: Technical progress report, February 15, 1991–July 15, 1993.** Williams, P.; Woodbury, N. Arizona State Univ., Tempe, AZ (United States). Dept. of Chemistry and Biochemistry. [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER61127. Order Number DE94007603. Source: OSTI; NTIS; GPO Dep.

This report describes efforts to harness mass spectrometry as a rapid means to sequence DNA. Synthetic oligonucleotides (8–60 base pairs) were employed to evaluate several approaches including ablation/ionization of DNA from ice films, DNA ablation from UV chromophore matrices, comparisons of ice and UV chromophore data, process control, collector experiments and ablation mechanisms.

13144 (DOE/ER/61487–2) **[Vertically intergrated analysis of human DNA]: Progress report, [April 1, 1993–February 28, 1994].** Olson, M.V. Washington Univ., Seattle, WA (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract FG06-92ER61487. Order Number DE94008068. Source: OSTI; NTIS; GPO Dep.

Progress is reported on several fronts aimed at DNA sequencing using cosmids-contigs. Specifically results gained in exploiting RARE (recA-assisted-restriction enzyme) cleavage, in clone isolation by flow cytometry, in cosmid-DNA preparations, in automated interpretation of digitized gel images and in contig building via multiple complete digest (MCD) mapping are briefly described.

13145 (DOE/ER/61490–1) **Transcribed sequences in the human genome to be held in San Francisco, November 7 and 8, 1992: Final report, September 1, 1992–August 31, 1993.** Gardiner, K. Eleanor Roosevelt Inst., Denver, CO (United States). Nov 1993. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER61490. (CONF-9311172–Absts.: 2. international workshop on the identification of transcribed sequences, San Francisco, CA (United States), 7-8 Nov 1993). Order Number DE94007021. Source: OSTI; NTIS; GPO Dep.

The Second International Workshop on the Identification of Transcribed Sequences was held in San Francisco on November 7–8, 1992. The purpose of the workshop was to discuss and evaluate techniques for developing a complete transcriptional map of the human genome. Such a map requires the positions, sequences, and expression patterns of all genes. This goal is being approached from two different directions, each with strengths and weaknesses. One method is to identify the transcribed sequences from genomic DNA of a given region; the other is to systematically sequence and map cDNAs. The cDNA approach yields sequence information rapidly, but mapping each cDNA is a technical challenge. In the first approach, the map locations of genomic sequences are known at the outset, and the challenge is to identify exons. The efficient construction of a transcriptional map will require a diverse array of techniques.

13146 (ORISE–92/K-61) **Medical Sciences Division Oak Ridge Institute for Science and Education report for 1992.** Oak Ridge Inst. for Science and Education, TN (United States). [1992]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00033. Order Number DE94000642. Source: OSTI; NTIS; GPO Dep.

Research programs from the medical science division of the Oak Ridge Institute for Science and Education (ORISE) are briefly described in the following areas: Biochemistry, cytogenetics, microbiology, center for epidemiologic research, radiation medicine, radiation internal dose information center, center for human reliability studies, facility safety, occupational medicine, and radiation emergency assistance center/training site.

13147 **Sequential cloning of chromosomes.** Lacks, S.A. To Dept. of Energy. 1991. U.S. patent application 7-811,221. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94007362. Source: OSTI; NTIS; GPO Dep.

A method for sequential cloning of chromosomal DNA and chromosomal DNA cloned by this method are disclosed. The method includes the selection of a target organism having a segment of chromosomal DNA to be sequentially cloned. A first DNA segment, having a first restriction enzyme site on either side, homologous to the chromosomal DNA to be sequentially cloned is isolated. A first vector product is formed by ligating the homologous segment into a suitably designed vector. The first vector product is circularly integrated into the target organism's chromosomal DNA. The resulting integrated chromosomal DNA segment includes the homologous DNA segment at either end of the integrated vector segment. The integrated chromosomal DNA is cleaved with a second restriction enzyme and ligated to form a vector-containing plasmid, which is replicated in a host organism. The replicated plasmid is then cleaved with the first restriction enzyme. Next, a DNA segment containing the vector and a segment of DNA homologous to a distal portion of the previously isolated DNA segment is isolated. This segment is then ligated to form a plasmid which is replicated within a suitable host. This plasmid is then circularly integrated into the target chromosomal DNA. The chromosomal DNA containing the circularly integrated vector is treated with a third, retrorestriction enzyme. The cleaved DNA is ligated to give a plasmid that is used to transform a host permissive for replication of its vector. The sequential cloning process continues by repeated cycles of circular integration and excision. The excision is carried out alternately with the second and third enzymes.

13148 (SAND–93-8688) **A genetic algorithm based method for docking flexible molecules.** Judson, R.S. (Sandia National Labs., Livermore, CA (United States)); Jaeger, E.P.; Treasurywala, A.M. Sandia National Labs., Livermore, CA (United States). Nov 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DR00789. Order Number DE94007525. Source: OSTI; NTIS; GPO Dep.

The authors describe a computational method for docking flexible molecules into protein binding sites. The method uses a genetic algorithm (GA) to search the combined conformation/orientation space of the molecule to find low energy conformation. Several techniques are described that increase the efficiency of the basic search method. These include the use of several interacting GA subpopulations or niches; the use of a growing algorithm that initially docks only a small part of the molecule; and the use of gradient minimization during the search. To illustrate the method, they dock Cbz-GlyP-Leu-Leu (ZGLL) into thermolysin. This system was chosen because a well refined crystal structure is available and because another docking method had previously been tested on this system. Their method is able to find conformations that lie physically close to and in some cases lower in energy than the crystal conformation in reasonable periods of time on readily available hardware.

13149 (UCRL-JC–115163) **X-ray imaging and x-ray source development at Lawrence Livermore National Laboratory.** Trebes, J. (Lawrence Livermore National Lab., CA (United States)); Balhorn, R.; Anderson, E. Lawrence Livermore National Lab., CA (United States). Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309290–2: 4. international conference on x-ray microscopy, Chenogolovka (Russian Federation), 20-24 Sep 1993). Order Number DE94007077. Source: OSTI; NTIS; GPO Dep.

The Laser Program at Lawrence Livermore National Laboratory has a continuing effort to develop both x-ray sources and x-ray sources and x-ray microscopy. This effort includes the ongoing development of: (1) a wide range of x-ray lasers at the Nova Laser Facility, (2) a zone plate lens–multilayer mirror based x-ray microscope (3) three dimensional, high resolution x-ray microscopy (4) short wavelength, normal incidence multilayer x-ray mirrors, (5) compact, high average power lasers for producing x-ray lasers and laser plasma x-ray sources. We have constructed and operated an x-ray laser based transmission x-ray microscope. The advantage offered by the x-ray laser source is the extreme high brightness allows high resolution images to be made on a timescale faster than that for x-ray damage effects to appear. The microscope, consists of: the x-ray laser, a multilayer coated, near normal incidence spherical mirror used as a condenser, a silicon nitride specimen holder, an x-ray zone plate used as an objective lens, and a microchannel plate x-ray detector. The x-ray laser used is the Ni-like Ta x-ray laser operating with a wavelength of 4.48 nm, a pulselength of 200 spec, a divergence of 10 mrad, and an output energy of 10 microjoules.

5503 Cytology

Refer also to citation(s) 13137, 13141

13150 (DOE/ER/61497–1) **Reporting of the third international workshop on human chromosome 22 mapping.** Emanuel, B.S.; Buetow, K.; Nussbaum, R.; Scambler, P; Lipinski, M.; Overton, C. Children's Hospital of Philadelphia, PA (United States). [1992]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER61497. (CONF-9209197–Exc.: 3. international workshop on chromosome 22, Philadelphia, PA (United States), 17-20 Sep 1992). Order Number DE94002769. Source: OSTI; NTIS; GPO Dep.

The third international workshop on the mapping of human chromosome 22 was held at the Sugarloaf Conference Center in Philadelphia Pennsylvania USA from September 17–20, 1992. It was organized by Beverly S. Emanuel of Children's Hospital of

Philadelphia and the Human Genome Center for Chromosome 22. The highlights of the conference included the discussion of the chromosome 22 gene at the Ewings Sarcoma breakpoint, the identification of a polymorphic TG/CA repeat containing locus tightly linked to the NF2 gene, the isolation of a candidate tumor suppressor locus for meningioma, the isolation of numerous as yet uncharacterized new cDNAs for chromosome 22 and the progress which has been made on generating physical and genetic maps of the chromosome. There is a new genetic map comprised of 16 short tandem repeat polymorphism (STRP) markers of which 12 have greater than 70% heterozygosity (Fig. 1). It was decided that the next meeting should be held in 18 months and it will be organized by Peter Scambler in the United Kingdom.

5504 Genetics

Refer also to citation(s) 11454, 11461, 13132, 13134, 13142, 13143, 13144, 13145

13151 (DOE/ER/60533–6) **Studies of human mutation rates: Progress report, November 1992–October 1993.** Neel, J.V.; Hanash, S.M. Michigan Univ., Ann Arbor, MI (United States). 27 Oct 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER60533. Order Number DE94003398. Source: OSTI; NTIS; GPO Dep.

The progress during 1992–1993 with respect to ER 60533 is summarized in this report under three headings: The development of two-dimensional DNA gels for the detection of mutation, the mitochondrial DNA of American Indians, and molecular verification of a suggested polyogeny for the eight most common phosphoglucomutose-1 (POM1)alleles.

13152 (LA-UR–94-110) **Neural network definitions of highly predictable protein secondary structure classes.** Lapedes, A. (Los Alamos National Lab., NM (United States)); Steeg, E.; Farber, R. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9311171–2: Neural information processing systems (NIPS) conference, Denver, CO (United States), 30 Nov - 2 dec 1993). Order Number DE94006234. Source: OSTI; NTIS; GPO Dep.

We use two co-evolving neural networks to determine new classes of protein secondary structure which are significantly more predictable from local amino sequence than the conventional secondary structure classification. Accurate prediction of the conventional secondary structure classes: alpha helix, beta strand, and coil, from primary sequence has long been an important problem in computational molecular biology. Neural networks have been a popular method to attempt to predict these conventional secondary structure classes. Accuracy has been disappointingly low. The algorithm presented here uses neural networks to similtaneously examine both sequence and structure data, and to evolve new classes of secondary structure that can be predicted from sequence with significantly higher accuracy than the conventional classes. These new classes have both similarities to, and differences with the conventional alpha helix, beta strand and coil.

13153 DNA fragment sizing and sorting by laser-induced fluorescence. Jett, J.H.; Hammond, M.L.; Keller, R.A.; Marrone, B.L.; Martin, J.C. To Dept. of Energy. 1992. U.S. patent application 7-841,114. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007342. Source: OSTI; NTIS; GPO Dep.

A method is provided for obtaining DNA fingerprints using high speed detection systems, such as flow cytometry to determine unique characteristics of DNA pieces from a selected sample. In one characterization the DNA piece is fragmented at preselected sites to produce a plurality of DNA fragments. The DNA piece or the resulting DNA fragments are treated with a dye effective to stain stoichiometrically the DNA fragments. The fluorescence from the dye in the stained fragments is then examined to generate an output functionally related to the number of nucleotides in each one of the DNA fragments. In one embodiment, the intensity of the fluorescence emissions from each fragment is directly proportional to the fragment length. Additional dyes can be bound to the DNA piece and DNA fragments to provide information additional to length information. Oligonucleotide specific dyes and/or hybridization probes can be bound to the DNA fragments to provide information on oligonucleotide distribution or probe hybridization to DNA fragments of different sizes.

5505 Metabolism

Refer also to citation(s) 11897

13154 (UCRL-JC–114785) **Tritium AMS for biomedical applications.** Roberts, M.L.; Velsko, C.; Turteltaub, K.W. Lawrence Livermore National Lab., CA (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930960–2: 6. international conference on accelerator mass spectrometry, Canberra (Australia), 17 Sep - 1 oct 1993). Order Number DE94002014. Source: OSTI; NTIS; INIS; GPO Dep.

We are developing ^{3}H-AMS to measure ^{3}H activity of mg-sized biological samples. LLNL has already successfully applied ^{14}C AMS to a variety of problems in the area of biomedical research. Development of ^{3}H AMS would greatly complement these studies. The ability to perform ^{3}H AMS measurements at sensitivities equivalent to those obtained for ^{14}C will allow us to perform experiments using compounds that are not readily available in ^{14}C-tagged form. A ^{3}H capability would also allow us to perform unique double-labeling experiments in which we learn the fate, distribution, and metabolism of separate fractions of biological compounds.

5506 Medicine

Refer also to citation(s) 12247, 12661, 12696

13155 (DOE/ER/60407–T2) **Improving cancer treatment with cyclotron produced radionuclides: Progress report.** Larson, S.M.; Finn, R.D. Memorial Sloan-Kettering Cancer Center, New York, NY (United States). 1 Nov 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER60407. Order Number DE94006027. Source: OSTI; NTIS; GPO Dep.

This report describes our continuing long term goal of promoting nuclear medicine applications by improving the scientific basis for tumor diagnosis, treatment and treatment follow-up based on the use of cyclotron produced radiotracers in oncology. The program includes 3 interactive components: Radiochemistry/Cyclotron; Pharmacology; and Immunology. An essential strategy is as follows: novel radionuclides and radiotracers developed in the Radiochemistry/Cyclotron section will be employed in the Pharmacology and Immunology sections during the next year. The development of novel radionuclides and tracers is of course useful in and of itself, but their utility is greatly enhanced by the interaction with the immunology and pharmacology components of the program.

13156 (DOE/ER/60434–8) **Boron in nuclear medicine: New synthetic approaches to PET and SPECT: Progress report, May 1, 1993–April 30, 1994.** Kabalka, G.W. Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry. Feb 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-86ER60434. Order Number DE94005678. Source: OSTI; NTIS; INIS; GPO Dep.

New methods based on reactive organometallic precursors containing organic functional groups that are generally responsible for physiologic responses are being exploited for preparation of radiopharmaceutials. This program focuses on the design of new chemistry (molecular architecture) and technology as opposed to the application of known reactions to the synthesis of specific radiopharmaceutical. The new technology which is often based on organoborane chemistry is then utilized in nuclear medicine research at the UT Biomedical Imaging Center and in collaboration with colleagues at other DOE. facilities such as Brookhaven National Laboratory and Oak Ridge National Laboratory. New radiopharmaceutical are evaluated preclinically by colleagues at UT, Emory University and The University of Pennsylvania, and by Nova Screen.

13157 (DOE/ER/61610–1) **Molecular medicine: Synthesis and in vivo detection of agents for use in neutron capture therapy: Progress report, May 1, 1993–April 30, 1994.** Kabalka, G.W. University of Tennessee Medical Center, Knoxville, TN (United States). Dept. of Radiology. Feb 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-93ER61610. Order Number DE94006069. Source: OSTI; NTIS; INIS; GPO Dep.

Methods or preparation of potential neutron capture therapy agents involving carboranyl precursors are described.

13158 (EGG–2700/92) **INEL BNCT Research Program, Program publications 1992.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 241p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94003659. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a collection of the published reports describing research supporting the Idaho National Engineering Laboratory (INEL) Boron Neutron Capture Therapy (BNCT) Research Program for calendar year 1992. Contributions from the principal investigators about their individual projects are included, specifically, chemistry (pituitary tumor studies, boron drug development including liposomes, lipoproteins, and carboranylalarnine derivatives), pharmacology (murine screenings, toxicity testing, ICP-AES analysis of biological samples), physics (radiation dosimetry software, neutron beam and filter design, neutron beam measurement dosimetry), and radiation biology (small and large animal models tissue studies and efficacy studies). These reports have previously appeared in two books: Progress in Neutron Capture Therapy for Cancer, edited by B. J. Allen, D. E. Moore, B. V. Harrington, Plenum Press, 1992; and Boron Neutron Capture Therapy Toward Clinical Trials of Glioma Patients, edited by D. Gabel and R. Moss, Plenum Press, 1992. Reports have also appeared in four journals: Analytica Chimica Acta, Inorganic Chemistry, Nuclear Science and Engineering, and the Proceedings of the National Academy of Science.

13159 (ETDE-IT–94-26) **Implications of medical devices quality assurance for implementation of experimental clinical trials.** Tirindelli Danesi, D. (ENEA, Rome (Italy). Area Energia Ambiente e Salute); Altavista, P.; Marino, C.; Benassi, M. No corporate text available. 1992. 10p. (CONF-9203294–1: Regulatory aspects of medical devices for therapy, Rome (Italy), 19-20 Mar 1992). Order Number DE94752547. Source: OSTI; NTIS (US Sales Only).

The basis for all controlled clinical trials is the comparison of a new treatment with the standard treatment. The effect of the experimental procedure on the natural history of the disease is the result observed; but the interpretation of the results in cancer clinical experimentation is often difficult due to the variability of the clinical course of individual cancers in a given category. It has been possible to categorize cancers by means of prognostic factors and evaluate the results of therapy within each prognostic category, but there is still much variability within each category. The only way to determine whether or not a new treatment can be used for a particular form of cancer is to try it out on patients in clinical trials. The cooperative practice was originally induced by the realistic need for large sample sizes, but the variability in the interpretation of the results increased due to difficulties in comparing data. This is one of the main problems in cancer literature. These problems originate from inconsistent or incomplete reporting of the patient population under study, the treatment administered, the statistical methods employed to assess treatment efficacy and from differences in the definition of response criteria. This paper tries to outline the impact on the results evaluation of the lack of standardized prognostic factors and standardized therapeutic modalities in the selection and treatment of patients included in clinical trials.

13160 (FRCEA-TH–379) **Use of an object model in three dimensional image reconstruction. Application in medical imaging.** Delageniere-Guillot, S. CEA Centre d'Etudes de Grenoble, 38 (France). Direction des Technologies Avancees; Institut National Polytechnique, 38 - Grenoble (France). Feb 1993. 208p. (In French). Order Number DE94617962. Source: OSTI; NTIS (US Sales Only); INIS.

Threedimensional image reconstruction from projections corresponds to a set of techniques which give information on the inner structure of the studied object. These techniques are mainly used in medical imaging or in non destructive evaluation. Image reconstruction is an ill-posed problem. So the inversion has to be regularized. This thesis deals with the introduction of a priori information within the reconstruction algorithm. The knowledge is introduced through an object model. The proposed scheme is applied to the medical domain for cone beam geometry. We address two specific problems. First, we study the reconstruction of high contrast objects. This can be applied to bony morphology (bone/soft tissue) or to angiography (vascular structures opacified by injection of contrast agent). With noisy projections, the filtering steps of standard methods tend to smooth the natural transitions of the investigated object. In order to regularize the reconstruction but to keep contrast, we introduce a model of classes which involves the Markov random fields theory. We develop a reconstruction scheme: analytic reconstruction-reprojection. Then, we address the case of an object changing during the acquisition. This can be applied to angiography when the contrast agent is moving through the vascular tree. The problem is then stated as a dynamic reconstruction. We define an evolution AR model and we use an algebraic reconstruction method. We represent the object at a particular moment as an intermediary state between the state of the object at the beginning and at the end of the acquisition. We test both methods on simulated and real data, and we prove how the use of an a priori model can improve the results. (author).

13161 (GSI–93-50(prepr.)) **Physics and radiobiology of heavy charged particles in relation to the use of ion beams for therapy.** Kraft, G.; Haberer, T.; Schardt, D.; Scholz, M. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jul 1993. 14p. (CONF-9304234–: Workshop modelling in clinical radiobiology, Wuerzburg (Germany), 25-27 Apr 1993). Order Number DE94752456. Source: OSTI; NTIS (US Sales Only); INIS.

Heavy charged particles are the most advanced tool of an external subcutane radiotherapy of deep seated tumors. Small angular- and lateral-scattering and the increase of the energy deposition with penetration depth are the physical basis for a more efficient tumor targeting. High biological efficiency in the tumor is the prerequisite for a successful treatment of tumors radioresistant against sparsely ionizing radiation. The possibility to perform target conform irradiation and to control the achieved/actual distribution using PET techniques guarantees that biological highly efficient stepping particles can be restricted to the tumor volume only. Although the physical and radiobiological properties of ion beams are very favourable for therapy, the necessity to produce these particles in an accelerator restricts a general application of heavy ions up to now. Presently the heavy ion accelerator SIS at GSI is the only source of heavy ion beams, sufficient in energy and intensity for therapy. A therapy unit is in preparation at GSI, the status of this project is given at the end of the paper. (orig.)

13162 (INIS-BR–3263) **Influence of quantum noise on radiological images.** Almeida, A. de. Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica. 1990. 128p. (In Portuguese). Order Number DE94617963. Source: OSTI; NTIS (US Sales Only); INIS.

The fundamental limits to the spatial resolution and to the contrast attainable in radiological images are owing to the quantum nature ox X-radiation. Small low-contrast details in anatomic structures may be revealed only by increasing the fluence of photons absorbed by those structures, an acceptable procedure in industrial applications but which incurs a proportional risk to the patient in clinical applications of X-rays. An analytical procedure to find the optimal compromise between the diagnostic conditions of high patient absorbance is developed, for which few photons remains to carry information to the detectors, and low patient absorbance, for which the quantum fluctuations in the large number of photons reaching the detectors obscure the information. (author).

13163 (INIS-mf–13780, pp. 52-53) **Investigating neutron emission effect passing inhomogeneous samples in neutron radiography and tomography by Monte Carlo simulation method.** Kamali Mogadam, K. (Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Nuclear Information Centre). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference,

Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COMPUTERIZED TOMOGRAPHY/neutron emission; MONTE CARLO METHOD; NEUTRON RADIOGRAPHY; PATIENTS

13164 (KURRI-TR–374) **Establishment of optimal thermal neutron capture therapy for 5 types of human malignant melanoma.** Mishima, Yutaka (ed.) (Mishima Inst. for Dermatological Research, Kobe (Japan)). Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst. Mar 1993. 280p. (In Japanese, English). Order Number DE94748703. Source: OSTI; NTIS; INIS.

A series of boron neutron capture therapy (BNCT) studies has already germinated in 1972, with a view to establishing the BNCT particularly suited for the treatment of various types of malignant melanoma, and has been succeeded by research teams comprised of multi-disciplinary members. Twelve patients (7 men and 5 women, aged from 50 to 85 years) with malignant melanoma have been treated with BNCT; among them, six patients were completely cured, four had extremely reduced tumors, and two were still in the clinical process. The present Progress Report is a compilation of 39 research presentations for the recent two years. In this report, three patients are described. Of these, one patient had deep-seated lesions in right and left lymph nodes. These lesions were cured by the use of D_2O that allowed neutron beams to reach them. Application of positron emission tomography to the diagnosis of melanoma is a highlight in this Report. (N.K.).

13165 (LA-UR–94-16) **Noninvasive spectroscopic diagnosis of superficial ocular lesions and corneal infections.** Mourant, J.R. (Los Alamos National Lab., NM (United States)); Bigio, I.J.; Johnson, T.; Shimada, T.; Gritz, D.C.; Storey-Held, K. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–8: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94006231. Source: OSTI; NTIS; GPO Dep.

The potential of a rapid noninvasive diagnostic system to detect tissue abnormalities on the surface of the eye has been investigated. The optical scatter signal from lesions and normal areas on the conjunctival sclera of the human eye were measured in vivo. It is possible to distinguish nonpigmented pingueculas from other lesions. The ability of the system to detect malignancies could not be tested because none of the measured and biopsied lesions were malignant. Optical scatter and fluorescence spectra of bacterial and fungal suspensions, and corneal irritations were also collected. Both scattering and fluorescence show potential for diagnosing corneal infections.

13166 (LA-UR–94-17) **Laser welding of bone: Successful in vitro experiments.** Mourant, J.R.; Anderson, G.D.; Bigio, I.J.; Johnson, T.M. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–9: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94006232. Source: OSTI; NTIS; GPO Dep.

A method for "welding" bones is being developed. Tensile joint strengths of chicken bones welded in vitro have exceeded one kilogram. Welding was performed with either a Nd:YAG (1064 nm) or a diode laser (820 nm). Light was delivered with an optical fiber held a few millimeters from the bone surface. A solder was developed to assist in the welding process.

13167 (LA-UR–94-78) **Comparative studies of brain activation with MEG and functional MRI.** George, J.S. (Los Alamos National Lab., NM (United States)); Aine, C.J.; Sanders, J.A.; Lewine, J.D.; Caprihan, A. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9308165–3: BIOMAG 93: international conference on biomagnetism, Vienna (Austria), 16-20 Aug 1993). Order Number DE94006223. Source: OSTI; NTIS; INIS; GPO Dep.

The past two years have witnessed the emergence of MRI as a functional imaging methodology. Initial demonstrations involved the injection of a paramagnetic contrast agent and required ultrafast echo planar imaging capability to adequately resolve the passage of the injected bolus. By measuring the local reduction in image intensity due to magnetic susceptibility, it was possible to calculate blood volume, which changes as a function of neural activation. Later developments have exploited endogenous contrast mechanisms to monitor changes in blood volume or in venous blood oxygen content. Recently, we and others have demonstrated that it is possible to make such measurements in a clinical imager, suggesting that the large installed base of such machines might be utilized for functional imaging. Although it is likely that functional MRI (fMRI) will subsume some of the clinical and basic neuroscience applications now touted for MEG, it is also clear that these techniques offer different largely complementary, capabilities. At the very least, it is useful to compare and cross-validate the activation maps produced by these techniques. Such studies will be valuable as a check on results of neuromagnetic distributed current reconstructions and will allow better characterization of the relationship between neurophysiological activation and associated hemodynamic changes. A more exciting prospect is the development of analyses that combine information from the two modalities to produce a better description of underlying neural activity than is possible with either technique in isolation. In this paper we describe some results from initial comparative studies and outline several techniques that can be used to treat MEG and fMRI data within a unified computational framework.

13168 (LA-UR–94-100) **Noninvasive identification of bladder cancer with sub-surface backscattered light.** Bigio, I.J. (Los Alamos National Lab., NM (United States)); Mourant, J.R.; Boyer, J.; Johnson, T.; Shimada, T.; Conn, R.L. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–15: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94006236. Source: OSTI; NTIS; GPO Dep.

A non-invasive diagnostic tool that could identify malignancy in situ and in real time would have a major impact on the detection and treatment of cancer. We have developed and are testing early prototypes of an optical biopsy system (OBS) for detection of cancer and other tissue pathologies. The OBS invokes a unique approach to optical diagnosis of tissue pathologies based on the elastic scattering properties, over a wide range of wavelengths, of the microscopic structure of the tissue. Absorption bands in the tissue also add useful complexity to the spectral data collected. The use of elastic scattering as the key to optical tissue diagnostics in the OBS is based on the fact that many tissue pathologies, including a majority of cancer forms, manifest significant architectural changes at the cellular and sub-cellular level. Since the cellular components that cause elastic scattering have dimensions typically on the order of visible to near-IR wavelengths, the elastic (Mie) scattering properties will be strongly wavelength dependent. Thus, morphology and size changes can be expected to cause significant changes in an optical signature that is derived from the wavelength-dependence of elastic scattering as well as absorption. The data acquisition and storage/display time with the OBS instrument is ~1 second. Thus, in addition to the reduced invasiveness of this technique compared with current state-of-the-art methods (surgical biopsy and pathology analysis), the OBS offers the possibility of impressively faster diagnostic assessment. The OBS employs a small fiber-optic probe that is amenable to use with any endoscope, catheter or hypodermic, or to direct surface examination (e.g., as in skin cancer or cervical cancer). We report here specifically on its potential application in the detection of bladder cancer.

13169 (LA-UR–94-0165) **MRIVIEW: An interactive computational tool for investigation of brain structure and function.** Ranken, D.; George, J. Los Alamos National Lab., NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931080–5: Visualization '93, San Jose, CA (United States), 25-29 Oct 1993). Order Number DE94006270. Source: OSTI; NTIS; INIS; GPO Dep.

MRIVIEW is a software system which uses image processing and visualization to provide neuroscience researchers with an integrated environment for combining functional and anatomical information. Key features of the software include semi-automated segmentation of volumetric head data and an interactive coordinate reconciliation method which utilizes surface visualization. The current system is a precursor to a computational brain atlas. We describe features this atlas will incorporate, including methods under development for visualizing brain functional data obtained from several different research modalities.

13170 (LBL–35050) **Hydrogenated amorphous silicon (a-Si:H) based gamma camera: Monte Carlo simulations.** Lee, H.; Drewery, J.S.; Hong, W.S.; Jing, T.; Kaplan, S.N.; Mireshghi, A.; Perez-Mendez, V. Lawrence Berkeley Lab., CA (United States). Jan 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940254–1: SPIE medical imaging conference, Newport Beach, CA (United States), 13-18 Feb 1994). Order Number DE94007042. Source: OSTI; NTIS; INIS; GPO Dep.

A new gamma camera using a-Si:H photodetectors has been designed for the imaging of heart and other small organs. In this new design the photomultiplier tubes and the position sensing circuitry are replaced by 2-D array of a-Si:H p-i-n pixel photodetectors and readout circuitry which are built on a substrate. Without the photomultiplier tubes this camera is light weight, hence can be made portable. To predict the characteristics and the performance of this new gamma camera we did Monte Carlo simulations. In the simulations 128 x 128 imaging array of various pixel sizes were used. ^{99m}Tc (140keV) and ^{201}Tl(70keV) were used as radiation sources. From the simulations we could obtain the resolution of the camera and the overall system, and the blurring effects due to scattering in the phantom. Using the Wiener filter for image processing, restoration of the blurred image could be achieved. Simulation results of a-Si:H based gamma camera were compared with those of a conventional gamma camera.

13171 (PCCF-RI–93-03) **Study by X-ray diffraction of the crystalline structure versus time of a radioactive implanted coral and of a non radioactive implanted coral.** Irigaray, J.L. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire); Oudadesse, H.; Sauvage, T.; El Fadl, H.; Lefevre, J.; Barlet, J.P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 13p. Order Number DE94618036. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Calcified Tissue International (DE).

The corals used as biomaterials in bone surgery consist of 98% calcium carbonate in the form of aragonite and have orthorhombic crystalline structure. This structure changes progressively into a bone structure in an hexagonal form when the coral is implanted in cortical or spongy surroundings. For this experiment, a radioactive and a non radioactive coral have been implanted in the metaphysics of the ovine femur. The transformation of the orthorhombic structure into the hexagonal bone structure has been studied for the two types of implant. This makes it possible to verify if radioactivity modifies the process of transformation of the implanted biocoral. (K.A.) 3 refs.; 7 figs.

13172 (PCCF-RI–93-04) **Comparison of the ossification kinetics after implantation of a radioactivated coral and a natural coral.** Irigaray, J.L. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire); Oudadesse, H.; Sauvage, T.; El Fadl, H.; Lefevre, J.; Barlet, J.P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 10p. Order Number DE94618037. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Materials Science: Materials in Medicine (UK).

The ossification kinetics of corals implanted in bones in vivo is discussed. An improved experimental protocol is described, in which the number of samples analysed has been increased at each date to achieve good statistics. The behaviour of a radioactive implanted sample has been studied in comparison with a non radioactive one. Moreover, the radioactivated samples have been used for other studies concerning radioactive tracers. (K.A.) 3 refs.; 6 figs.; 2 tabs.

13173 (PCCF-RI–93-05) **Study of the mineralization of coral implanted in vivo by radioactive tracers.** Irigaray, J.L. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire); Sauvage, T.; Oudadesse, H.; El Fadl, H.; Deschamps, N.; Lefevre, J.; Barlet, J.P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 14p. Order Number DE94618038. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Radioanalytical Chemistry (HU).

Coral may be used as a substitution biomaterial to the bone graft, due to its physico-chemical and architectural properties. The coral, after its implantation 'in vivo' reaches a mineral composition and crystalline structure comparable to those of a bone. The calcification mechanism of this implant is studied using ^{45}Ca as radioactive tracer. The atomic elements contained in the initial coral were analysed in function of the time spent in the body, by marking the calcium and the strontium contained in its structure. (K.A.) 8 refs.; 6 figs.; 4 tabs.

13174 (PCCF-RI–93-08) **Proceedings of biological applications of relativistic nuclei.** Alard, J.P.; Montret, J.C. (eds.). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 100p. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The workshop BARN 92 on various aspects of radiation treatment of tumours and of biological radiation effects on living system hosted 38 short papers. Each is indexed and abstracted separately for the INIS database. (R.P.).

13175 (PCCF-RI–93-08, pp. 12-14) **The role of charged particle therapy in radiation oncology.** Castro, J.R. (Lawrence Berkeley Lab., CA (United States)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. Contract DE-AC03-76SF00098. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Over 150 patients have been irradiated for unresectable or residual chordoma or chondrosarcoma of the skull base or spine using helium or neon ions. The local control and survival have been significantly improved compared to previous historical results using photon irradiation. This is in consequence to the improved dose localization of charged particles with their ability to deliver 10-30% more dose to the tumor while maintaining the same or lesser dose to adjacent normal structures. Heavy ion beams exemplify both dose distribution and improved biological potential secondary to their high-LET deposition. (R.P.) 9 refs.

13176 (PCCF-RI–93-08, pp. 15-16) **Radiobiological prerequisites for cancer therapy with heavy ions.** Gueulette, J. (Louvain Univ., Brussels (Belgium). Cliniques Universitaires St. Luc); Wambersie, A. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Heavy ions combine the advantage of a high physical selectivity with the high-LET advantages in the treatment of some type of tumours. However, since the proposed ions (carbon, neon, argon ...) cover a high LET range, their clinical application raises some specific problems. One is concerned with the steep RBE variations, the other with the utilization of the full potential therapeutic benefit of heavy ions. (R.P.) 2 figs.

13177 (PCCF-RI–93-08, pp. 17-18) **Some progress in boron neutron capture therapy.** Pignol, J.P. (Centre Paul-Strauss, 67 - Strasbourg (France)); Methlin, G.; Abbe, J.C.; Belkhou, R.; Daymard, N.; Massarelli, R.; Sahel, J.; Meyer, L. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p.

Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

After a historical overview of the application of neutrons to cancer therapy, collaboration is suggested for the application of BNCT with relativistic nuclei in the fields of neutron sources, microdosimetry and tumor selection. The treatment of uveal melanoma is considered. (R.P.) 4 refs.; 1 fig.

13178 (PCCF-RI–93-08, pp. 22-24) **Irradiation facilities for radiotherapy using protons, neutrons or pions.** Isabelle, D.B. (Centre National de la Recherche Scientifique (CNRS), 45 - Orleans-la-Source (France)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Three types of new radiotherapies are considered: pion therapy, proton therapy and neutron therapy for cancer treatment. The problems are discussed that must be solved to obtain beams with a good therapeutic efficiency. (R.P.) 8 refs.; 2 figs.

13179 (PCCF-RI–93-08, pp. 25-29) **Particle beams for conformal therapy.** Rosenwald, J.C. (Institut Curie, 75 - Paris (France)); Mazal, A.; Belshi, R.; Ponvert, D. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Conformal radiotherapy consists of the irradiation with high homogeneous doses to a well defined target volume, following closely the shape of this volume while protecting all the surrounding tissues. Charged particle beams are particularly well suited for this purpose provided that major effort and time are dedicated to any single patient. The necessary steps to perform conformal radiotherapy are discussed. (R.P.) 3 refs.; 2 figs.; 1 tab.

13180 (PCCF-RI–93-08, pp. 30-31) **Positron emission tomography for dose localization and beam monitoring in light ion tumour therapy.** Enghardt, W. (Forschungszentrum Rossendorf, Dresden (Germany)); Fromm, W.D.; Manfrass, P.; Pawelke, J.; Sobiella, M.; Geissel, H.; Keller, H.; Kraft, G.; Magel, A.; Muenzenberg, G. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A positron camera of two high-density avalanche chambers with a sensitive area of 50*28 cm^2 was installed at the beam line behind the fragment separator GSI in Darmstadt. Beams of β^+-radioactive ions were obtained from projectile fragmentation of ^{20}Ne primary particles. By this technique several tomograms of the range distributions of implanted radioactive beams have been taken. (R.P.) 8 refs.; 4 figs.

13181 (PCCF-RI–93-08, pp. 32-33) **Calculations of cross sections and depth-dose distributions when using heavy ion beams.** Sihver, L. (National Inst. of Radiological Sciences, Chiba (Japan)); Kanai, T. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

To calculate the total depth-dose distributions in a medium, the energy loss and the range of a specific fragment in the medium must be known. A computer code was developed for calculating the stopping power and range distributions for protons and heavy ions in any media. To calculate the beam attenuation, semiempirical total reaction cross section formulas were developed for proton-nucleus and nucleus-nucleus reactions. (R.P.) 6 refs.; 1 fig.

13182 (PCCF-RI–93-08, pp. 36-37) **What is the best particle for the heavy ion radiation therapy.** Kanai, T. (National Inst. of Radiological Sciences, Chiba (Japan)); Sihver, L.; Kawachi, K. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Preliminary results are presented for establishing a guide line to choose appropriate heavy ion beams for the various situations in radiation therapy. To compare the figure of merit of various heavy ion beams, a therapeutic gain factor has been defined. The preliminary conclusion is that carbon is the best particle for the heavy ion radiation therapy. (R.P.) 4 refs.; 1 fig.

13183 (PCCF-RI–93-08, pp. 70-73) **Protons and neutrons versus X or gamma rays external radiotherapy: alternative options: Uveal melanoma, prostate adenocarcinoma.** Rozan, R. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire); Bacin, F.; Albuisson, E.; Giraud, B.; Bard, J.J.; Donnarieix, D. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Two examples are shown which can be treated both by protons or neutrons but also by photons. Both have an equal chance of success but certainly slightly different therapeutic indications. One is uveal melanoma, a tumor developed from choroid and ciliary body; the other is prostate adenocarcinoma, the second most common malignancy in males in most industrialized countries. (R.P.).

13184 (PCCF-RI–93-08, pp. 74-75) **Protons and neutrons versus X or gamma rays external radiotherapy: alternative options.** Kantor, G. (Fondation Bergonie, 33 - Bordeaux (France)); Lagarde, P.; Chemin, A. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Two examples are shown which can be treated both by protons or neutrons but also by photons. First: arterio-veinous malformations (AVM) and the possibility to treat with external stereotactic radiotherapy or with protons; second: soft tissue sarcoma (STS) and the choice between external radiotherapy and neutrons. (R.P.).

13185 (PCCF-RI–93-08, pp. 76) **Neutrontherapy: From radiobiological expectation to clinical reality.** Breteau, N. (Centre Hospitalier Regional, 45 - Orleans (France). Service de Radiotherapie); Wambersie, A. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Among the high LET radiations, fast neutrons are the less expensive and the most widely used in therapy of some types of tumour. Two important conclusions can be derived from clinical and radiobiological data: the need for adequate patient selection, and the need for a high physical selectivity. (R.P.).

13186 (PCCF-RI–93-08, pp. 77-79) **Clinical indications for protontherapy.** Chauvel, P. (Centre de Lutte Contre le Cancer Antoine Lacassagne, 06 - Nice (France)); Habrand, J.L. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A historical overview of proton therapy is presented, and a comparative evaluation of using proton beams in terms of RBE and

accuracy is given. Some clinical results and statistics are evaluated, and clinical indications are discussed. (R.P.) 5 refs.; 1 tab.

13187 (PCCF-RI–93-08, pp. 80-81) **Optimization of the protontherapy beamline in Nice.** Brassart, N. (Centre de Lutte Contre le Cancer Antoine Lacassagne, 06 - Nice (France)); Herault, J.; Chauvel, P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In France, two facilities began the treatment of ocular melanomas with a proton beam in 1991: Nice and Orsay. The characteristics of the former facility are presented, including the description of the proton beam line and the therapy unit, dose measurements, quality assurance and radiation protection. (R.P.) 3 figs.

13188 (PCCF-RI–93-08, pp. 82-83) **A protontherapy cooperative group for uveal melanomas: the SERAG.** Chauvel, P. (Centre de Lutte Contre le Cancer Antoine Lacassagne, 06 - Nice (France)); Brassart, N.; Herault, J.; Courdi, A.; Lagrange, J.L.; Grange, J.D.; Caujolle, J.P.; Diallo-Rosier, L.; Porta, F.; Bornfeld, N. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The activities of the group SERAG in France in 1991 and 1992 is overviewed briefly. Their results of treating melanomas of 114 patients are described. Some details of the treatment are presented. (R.P.) 3 figs.; 1 tab.

13189 (PCCF-RI–93-08, pp. 84-85) **Status report of Laboratori Nazionali di Legnaro radiotherapy project.** Cera, F. (Istituto Nazionale di Fisica Nucleare, Legnaro (Italy)); Cherubini, R.; Haque, A.M.I.; Moschini, G.; Tiveron, P.; Calzavara, F.; Tomio, L.; Kraft, G. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A heavy ion radiotherapy program has been proposed by the INFN-Laboratori Nazionali di Legnaro in the framework of the development of the facilities already existing and under construction for heavy ions constituting the ADRIA accelerator project (heavy ion beams; energy $\simeq$ 1 GeV/amu). 170 new cancer cases per year could be suitable for primary treatment with radiation therapy, as clinical targets for the radiotherapy program at ADRIA. (R.P.) 3 refs.; 1 fig.; 1 tab.

13190 (PCCF-RI–93-08, pp. 86-87) **How to organize a possible future for protontherapy, considering the present constraints on health politics.** Chauvel, P. (Centre de Lutte Contre le Cancer Antoine Lacassagne, 06 - Nice (France)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The present status of protontherapy in 'extended' European Community is: six machines presently running at low to medium energy, three for medical purpose only, three for part-time medical applications. Three of these machines could be used for higher energy applications. Proposals for the construction of new facilities and their organization are presented, covering the evaluation of cost problems. (R.P.).

13191 (PCCF-RI–93-08, pp. 88-89) **Status of the therapy project at GSI.** Becher, W. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Boehne, D.; Haberer, T.; Kraft, G.; Kraft-Weyrather, W.; Mueller, M.; Ritter, S.; Schall, I.; Schardt, D.; Enghardt, W. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A program for the preparation of heavy ion therapy is presently carried out at GSI. The technical and physical part of this program consists of the development of a fast magnetic beam scanning system, of position sensitive particle counters, of beam localisation techniques using on line PET techniques, of beam fragmentation measurements in thick targets, of intensity constant extraction mode from the accelerator and of the design and optimization of a dedicated medical accelerator. (R.P.) 3 refs.; 4 figs.

5507 Microbiology

Refer also to citation(s) 11461, 11496, 11901, 13146

5509 Pathology

Refer also to citation(s) 13168

5510 Physiological Systems

Refer also to citation(s) 13133, 13167, 13169

13192 (ENEA-RT-INN–93-32) **Combat sports energy costs evaluation by remote sensing: Progress report 10: Man-environment heat exchange equation evolution and improvement.** Sacripanti, A. (ENEA, Rome (Italy). Direzione Sicurezza Nazionale e Protezione Sanitaria); Dal Monte, A.; Rossi, L.; Fabbri, M. No corporate text available. 1993. 56p. (In Italian). (RT/INN–93-32). Order Number DE94752546. Source: OSTI; NTIS (US Sales Only).

The foundation, evolution and related improvements of the new heat and mass transfer equation, used in the joint research of CONI-ENEA (the Italian National Agency for Energy, New Technologies and the Environment) - FILPJ are shown in this report. Emphasis is given to the experimental history and the changes that are justified in a more formal approach on the basis of theoretical thermodynamics or similarity and dimensional theory. The new form of the equation in the computer code actually utilized in the research is given in the appendix.

5520 Public Health

Refer also to citation(s) 11633, 13069

13193 (LBL–30971) **Data available from birth and death registries and cancer registries in the United States.** Wallin, B.L. (Lawrence Berkeley Lab., CA (United States)); Houser, A.R.; Merrill, D.W.; Selvin, S. Lawrence Berkeley Lab., CA (United States). Jan 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007493. Source: OSTI; NTIS; GPO Dep.

In the United States, cancer registries have been compiling data for decades, and state vital statistics offices have been compiling birth and death data for nearly a century. Although this information has been well used for disease surveillance and various studies, it could be better exploited by making it more readily available, reducing the duplication of effort that occurs when researchers at the private, city, county, state, and federal levels work separately on their data collection and disease investigations. This report summarizes the nationwide availability of birth and death records and cancer registry data, with particular emphasis on subcounty geographic detail, such as zip code and census tract. Birth and death data are available at the county level for the entire United States from the National Center for Health Statistics. However, county level data are inadequate for small area studies of potential environmental hazards. Hazards of current interest to the Department of Energy (DOE) include DOE facilities, nuclear power plants, and sources of electromagnetic radiation such as broadcasting towers and power lines.

5530 Agriculture and Food Technology

Refer also to citation(s) 11964, 11967, 11968, 12402

13194 (DOE/BP/64458–1) **Development of laser marking as a mass marking technique: Annual report FY 1993.** Blankenship, H.L.; Thompson, D. Washington Dept. of Fisheries, Olympia, WA (United States). Nov 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract BI79-92BP64458. Order Number DE94007083. Source: OSTI; NTIS; GPO Dep.

The first year of work with development of lasers as a mass marking technique provided both disappointing and encouraging results. A Coumarin Dye 480 laser was used to mark coho salmon in a variety of body locations and with varying energy levels. A "bleached" white mark was made void of any pigment. Areas marked included the nape area behind the head and in front of the dorsal fin, slightly above the anal fin, the upper lobe of the caudal fin, the dorsal fin and on the operculum. The mark appeared immediately after being lasered but started to gradually fade after one month and was fairly completely re-pigmented after three months. Complete removal and notching of the adipose fin was also attempted with a Carbon Dioxide laser. This surgical method of fin removal appears to have advantages over scissor excision (no bleeding or regeneration), and has possible application as part of a device or system which could be employed for mass marking.

13195 (DOE/ER/20037–1) **Mechanisms and genetic control of interspecific crossing barriers in lycopersicon: Progress report, First year, August 1, 1992.** Mutschler, M.A. (Cornell Univ., Ithaca, NY (United States)); McCormick, S. Cornell Univ., Ithaca, NY (United States). [1992]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER20037. Order Number DE94006505. Source: OSTI; NTIS; GPO Dep.

The goal of this program is to use Lycopersica esculentum and L. pennellii as a model system to study the interspecific reproductive barriers unilateral incongruity (UI), hybrid breakdown and interspecific aberrant ratio syndrome (IARS). Specifically we seek to determine the functional basis of UI including the timing of the failure of incongruous crosses, the developmental step(s) interrupted by UI, the tissue and genomes involved in UI.

13196 (ETDE-IT–94-41) **Radiopreservation of food: Toxicological and microbiological safety aspects.** Leonardi, M. (ENEA, Casaccia (Italy)); Mauro, F.; Spano', M. No corporate text available. 1992. 8p. (In Italian). (CONF-9211295–1: Food treatment with ionizing radiations: Scientific and sanitary aspects, Rome (Italy), 22 Nov 1992). Order Number DE94752624. Source: OSTI; NTIS (US Sales Only).

This paper reviews the findings and opinions of leading world health groups (e.g., the US Bureau of Foods - Irradiated Foods Committee, the World Health Organization, the European Communities Selected Committee, etc.) regarding the toxicological and microbiological safety aspects of food radiopreservation. For that which regards toxicology, research studies considered the practice of radiopreservation similar to that of the use of chemical preservatives, i.e., it adds to or forms new substances in the treated food, and care must be taken not to alter normal dietary balance during the performance of health effects studies. The paper notes that toxicological tests are insensitive to the effects induced by radiolysis products since the concentrations of these products are simply far too low. With regard to radiation induced mutations in radiopreserved foods, the paper notes that many study groups share the opinion that radiopreservation induced mutations are not qualitatively different from those produced in conventional treatment methods, and that the practice of radiopreservation appears to be, from a purely microbiological point of view, similar to cold pasteurization of solid foods. It is recommended that more effort be given to the dissemination of public information with regard to the possible health benefits afforded through the use of this food preservation technology.

13197 (IAEA-TECDOC–728, pp. 9-15) **Mutation breeding through in vitro culture techniques for resistance to cocoa swollen shoot virus disease.** Adu Ampomah, Y. (Cocoa Research Inst., Tafo (Ghana)). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

The Cocoa Swollen Shoot Virus (CSSV) disease is epidemic in cocoa (Theobroma cacao) in Ghana, but there is no resistant material in the genetic resources available. In order to widen the genetic variability in this crop, efforts were made to apply conventional mutation breeding and in combination with in vitro culture technique. Gamma irradiation with doses less than 100 Gy were applied to pollen, beans and vegetative buds, and more than 1,000 M_2/F_1 or M_1V_3 plants for each experiments were screened for CSSV resistance by patch grafting method. The results indicated that it is feasible to use vegetative buds and in vitro culture to generate the desired variation. Some promising CSSV resistant clones are under further testing. In vitro culture conditions are also reported. (author). 7 refs, 7 tabs.

13198 (IAEA-TECDOC–728, pp. 17-25) **Mutation induction and evaluation for resistance to leaf mottling in citrus.** Espino, R.R.C. (Philippines Univ., Los Banos, Laguna (Philippines). Dept. of Horticulture); Estrella, J.B.; Mitra, V.T.; Espino, T.M. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

A series of experiments were conducted to develop a protocol for in vitro culture of nuclear embryos and mutation induction in citrus. It was found that the optimum medium for support of in vitro growth and plantlet regeneration consisted of the basic Murashige and Skoog's medium supplemented with myo-inositol (100 mg/l), pyridoxine-HCl (1 mg/l), nicotinic acid (1 mg/l), thiamine (0.2 mg/l), Fe-EDTA (25 mg/l), sugar (20g/l), agar-agar (7 g/l) and benzyladenine (1 mg/l) with a pH of 5.7. LD_{50} for gamma irradiation was 100 - 150 Gy. For ethyl methanesulfonate, concentrations up to 24.6 ml/l were tolerable. Screening for resistance to leaf mottling organism among the resulting seedlings gave promising results. A few plants had been recovered exhibiting a certain degree of resistance to this pathogen. (author). 1 ref., 10 tabs.

13199 (IAEA-TECDOC–728, pp. 27-36) **In vitro obtention and selection of pear mutants resistant to fire blight (Erwinia amylovora).** Leblay, C. (Institut National de la Recherche Agronomique (INRA), Beaucouze, Angers (France). Station d'Amelioration des Especes Fruitieres et Ornementales); Chevreau, E.; Brisset, M.N.; Paulin, J.P. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

To develop a standard protocol for in vitro culture technique to support mutation breeding of fruit trees, procedures for mutagen treatment and selection methods for resistance to fire blight (by Erwinia amylovora) were investigated. ^{60}Co gamma rays or ultra violet light (257 nm) were used as mutagens. Leaves were irradiated then adventitious buds were regenerated on the in vitro culture medium. The regenerated plants were tested by artificial inoculation with pathogen to in vitro cultured plants and confirmed in the greenhouse. Conductivity test to measure the net electrolyte leakage seemed to be a good method to quantify the resistance to the pathogen. (author). 5 refs, 6 figs.

13200 (IAEA-TECDOC–728, pp. 37-41) **Induced mutation for bacterial blight resistance in mulberry.** Phadvibulya, V. (Office of Atomic Energy for Peace, Bangkok (Thailand). Biological Science Div.); Meesilpa, P.; Charoenstaporn, R. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

Buds of mulberry varieties Phai, Noi and SK2502 were irradiated by gamma radiation and then cultured on the Murashige and Skoog medium containing 1.0 mg/l of BA and Casein hydrolysate 1g/l. After proliferation of shoots, they were transferred to the rooting medium (MS + NAA 0.2 mg/l + IBA 0.2 mg/l). Plantlets of mulberry var. Noi were transplanted to soil in greenhouse for screening for bacterial blight disease resistance. All plants showed symptoms of disease. In vitro inoculation of the pathogen, Pseudomonas syringae p.v. mori, on plantlets of the mulberry var. Noi and Phai was conducted. All plants showed symptoms of the disease and died. In vitro screening will be continued with much larger populations in order to select the resistance traits. (author). 4 refs, 4 tabs.

13201 (IAEA-TECDOC–728, pp. 43-48) **Combined use of in vitro culture and induced mutation for improving complex disease resistance of wheat (Triticum aestivum).** Wang, L. (Chinese Academy of Agricultural Sciences, Beijing (China). Inst. for Application of Atomic Energy); Tao, S.; Zhang, J.; Shi, J. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

Three genotypes of Triticum were pollinated by pollen of Leymus racemosus inflorescences which were irradiated with 0, 10, 15, and 20 Gy of gamma rays before blooming. Immature embryos were cultured in vitro and continued subculturing for propagation. Forty one plants were obtained. The percentages of acquired embryos, plantlets and survival plants were higher in some treated combinations than their controls. The combination of Xinjiang wheat (T. aestivum sub-sp.) and L. racemosus (gamma irradiated) was the best. The progenies were studied in agronomic characters, cytology, isoenzyme patterns and ELISA. The results showed that some progenies were similar to their female parents in most of their characters and the number of somatic chromosomes; the new characters obtained did not segregate in F_2M_2 and F_3M_3; some progenies demonstrated typical bands of leaf peroxidase isoenzyme of L. racemosus and several plants with BYDV-resistance; it was very likely that some genes of L. racemosus were transferred into wheat. The preliminary investigation suggested that wide-crosses between Triticum and Leymus racemosus by means of pollen irradiation and in vitro embryo culture could be an effective way to obtain desirable disease resistant variants in wheat. (author). 4 refs, 1 fig., 5 tabs.

13202 (IAEA-TECDOC–728, pp. 49-58) **Studies of the in vitro selection of novel disease resistant plants and mutagenesis of cultured cells.** MacDonald, M.V. (Cambridge Univ., Cambridge (United Kingdom). Dept. of Plant Sciences). Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

Plants of Brassica napus ssp. oleifera cv Primor which had been regenerated from secondary embryoids were found to be more susceptible to Leptosphaeria maculans than those grown from seed, but were generally more resistant to Alternaria brassicicola. In vitro selection of secondary embryoids on medium containing toxic filtrates of A. brassicicola did not result in significantly higher levels of resistance to the pathogen, and in the case of L. maculans, the plants were found to be more susceptible after the selection steps. When tissues were challenged with pycnidiospores of L. maculans it was possible to define growth conditions in which differential reactions correlated with in vivo responses. Studies on in vitro mutagenesis revealed that low doses of gamma rays enhanced the production of anther embryoids, although, whereas both gamma and X-rays reduced the regeneration capacity of treated tissues, irradiation with UV did not. Increased resistance to A. brassicicola was detected in doubled haploid plants following a seed treatment with EMS and from microspore culture following UV irradiation. In vitro studies of Helianthus annuus and Macrophomina phaseolina, and Zea mays and Fusarium moniliforme are also reported. (author). 28 refs, 2 figs, 2 tabs.

13203 (IAEA-TECDOC–728, pp. 59-62) **In vitro selection of plants for resistance to necrotic symptoms.** Barna, B. (Hungarian Academy of Sciences, Budapest (Hungary). Plant Protection Inst.); Adam, A.; Ersek, T.; Kiraly, Z. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

To develop an effective in vitro screening system for mutation breeding work, an appropriate screening agent and the method to utilize it are the fundamental components. In the present research, reaction of the host plants to necrotrophic pathogens were examined in relation to the comparable reaction to superoxide resistance. The research used Solanaceae crops (potato and tomato) as materials, and sensitivities to Phytophthora toxin were compared among cultivars. Differential sensitivities were observed between callus and root cap cells, the latter showed better reactions than the former to differentiate sensitive and resistant cultivars. (author). 7 refs, 1 tab.

13204 (IAEA-TECDOC–728, pp. 63-82) **Application of host-specific toxins from fungal plant pathogens as a mass screening measure for disease-resistant genotypes of crop cells.** Kohmoto, K. (Tottori Univ., Koyama, Tottori (Japan). Lab. of Plant Pathology); Otani, H.; Kodama, M.; Akimitsu, K.; Itoh, Y.; Shimomura, N.; Nutsugah, S.K.; Rao, S.R.; Tabira, H. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

Use of pathotoxins to screen disease resistant cells, clones or lines was reviewed and selection strategies of host specific toxin (HST) and it application were described in this report. Successful applications of Alternaria toxins in tomato, Japanese pear and apple were reported, although applications were made by in vivo system. It should be noted that there were opposing reports on reactions of in vitro cultured tomato cell clones to AAL-toxin. The reason for the discrepancy is not clear yet. Differences in bioassay systems and cell lines employed might be possible reasons. (author). 33 refs, 7 figs, 16 tabs.

13205 (IAEA-TECDOC–728, pp. 83-91) **The phytotoxins of Mycosphaerella fijiensis, the causative agent of Black Sigatoka disease, and their potential use in screening for disease resistance.** Strobel, G.A. (Montana State Univ., Bozeman, MT

(United States). Dept. of Plant Pathology); Stierle, A.A.; Hershenhorn, J.; Molina, G.; Upadhyay, R. Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. (CONF-9110527–: Final research co-ordination meeting on induced mutations and in vitro culture techniques for improving crop plant resistance to diseases, Gruenbach (Germany), 7-11 Oct 1991). In *Induced mutations and in vitro culture techniques for improving crop plant resistance to diseases: Proceedings of a final research co-ordination meeting held in Gruenbach, Germany, 7-11 October 1991.* 102p. Order Number DE94617866. Source: OSTI; NTIS (US Sales Only); INIS.

Black Sigatoka is the most threatening and devastating disease of bananas and plantains in the world. Currently, a worldwide search is underway either to find or to produce cultivars that are disease resistant or tolerant. Phytotoxins isolated from the causing disease agent might facilitate the discovery of such cultivars. To this end, we have succeeded in isolating several aromatic compounds from liquid cultures of Mycosphaerella fijiensis, the causal agent of Black Sigatoka disease of bananas and plantains. The most abundant and phytotoxic of these compounds is 2,4,8-trihydroxytetralone, which induces necrotic lesions at 5 g/5 l in less than 12 h on sensitive cultivars of bananas. This compound exhibits host-selectivity that mimics that of the pathogen. Other phytotoxins isolated from this fungus, in lesser amounts, were juglone, the novel compound, 2-carboxy-3-hydroxycinnamic acid, isoochracinic acid and 4-hydroxyscytalone. Some of these phytotoxins appear to be melanin shunt pathway metabolites. In preliminary studies, in tissue cultures, tetralone has been demonstrated as an effective tool in selecting banana/plantain for resistance. (author). 30 refs, 1 fig., 2 tabs.

13206 (INIS-BR–3246) **Evaluation of phenolic, tannin and phytate participation on iron bioavailability in irradiated beans.** Pinn, A.B.O. (Sao Paulo Univ., SP (Brazil). Faculdade de Ciencias Farmaceuticas); Colli, C.; Mancini Filho, J. Sociedade Brasileira de Ciencia e Tecnologia de Alimentos, Piracicaba, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-9206433–: 13. Brazillian congress on food science and technology, Sao Paulo (Brazil), 23-26 Jun 1992). Order Number DE94615912. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEANS/biological radiation effects; BEANS/irradiation; BEANS; IRRADIATION; GAMMA RADIATION; HEMOGLOBIN; IRON; PHENOLS; PHYTIC ACID; RADIATION DOSES; TANNIC ACID

13207 (INIS-BR–3247) **Storage effect over the cooking time and tannin and phenolic tenors of irradiated beans.** Takaki, K. (Sao Paulo Univ., SP (Brazil). Faculdade de Ciencias Farmaceuticas); Mancini Filho, J. Sociedade Brasileira de Ciencia e Tecnologia de Alimentos, Piracicaba, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-9206433–: 13. Brazillian congress on food science and technology, Sao Paulo (Brazil), 23-26 Jun 1992). Order Number DE94615913. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEANS/biological radiation effects; BEANS/irradiation; BEANS; IRRADIATION; FOOD PROCESSING; GAMMA RADIATION; HYDRATION; PHENOLS; RADIATION DOSES; STORAGE; TANNIC ACID

13208 (INIS-BR–3248) **Effects of gamma and microwave radiation over some biochemical properties of bean, before and during the storage.** Cunha, M.F. (Universidade Estadual de Campinas, SP (Brazil). Faculdade de Engenharia de Alimentos e Agricola); Sgarbieri, V.C. Sociedade Brasileira de Ciencia e Tecnologia de Alimentos, Piracicaba, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-9206433–: 13. Brazillian congress on food science and technology, Sao Paulo (Brazil), 23-26 Jun 1992). Order Number DE94617870. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEANS/biological radiation effects; BEANS/irradiation; BEANS; IRRADIATION; GAMMA RADIATION; METHIONINE; MICROWAVE RADIATION; PEROXIDASES; PHYTIC ACID; STORAGE; TEMPERATURE DEPENDENCE

13209 (INIS-BR–3249) **Effects of gamma and microwave radiation over the steadiness of beans grains, before and during the storage. Relation between the sensorial and instrumental measures.** Cunha, M.F. (Universidade Estadual de Campinas, SP (Brazil). Faculdade de Engenharia de Alimentos e Agricola); Sgarbieri, V.C.; Damasio, M.H. Sociedade Brasileira de Ciencia e Tecnologia de Alimentos, Piracicaba, SP (Brazil). 1992. 2p. (In Portuguese). (CONF-9206433–: 13. Brazillian congress on food science and technology, Sao Paulo (Brazil), 23-26 Jun 1992). Order Number DE94617871. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BEANS/biological radiation effects; BEANS/food processing; BEANS; CEREALS; COMPARATIVE EVALUATIONS; GAMMA RADIATION; MICROWAVE RADIATION; SEEDS; STORAGE

13210 (INIS-BR–3284) **Determination of lethal dose of Cobalt 60 gamma radiation in Opius sp. as a parasite of Anastrepha obliqua pupae.** Artur, V. (Centro de Energia Nuclear na Agricultura (CENA), Piracicaba, SP (Brazil)); Walder, J.M.M.; Vicino, S.R.; Silva, A.C. da; Hentz, D.T. Sociedade Brasileira de Zoologia, Curitiba, PR (Brazil). 1988. 1p. (In Portuguese). (CONF-8801186–: 15. Brazilian Congress on Zoology, Curitiba (Brazil), 31 Jan - 5 feb 1988). Order Number DE94620772. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PUPAE/lethal radiation dose; PUPAE/radiosensitivity; COBALT 60; COMPARATIVE EVALUATIONS; DOSE-RESPONSE RELATIONSHIPS; GAMMA RADIATION; LETHAL IRRADIATION; PARASITES; PARASITIC DISEASES; PEST CONTROL; PLANT DISEASES; PUPAE; RADIOSENSITIVITY; RADIATION EFFECTS; SURVIVAL CURVES

13211 (INIS-mf–13820) **Animal production and health newsletter. No. 19.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Jan 1994. 34p. Order Number DE94620773. Source: OSTI; NTIS (US Sales Only); INIS.

This newsletter includes brief reviews of three Research Coordination Meeting held in September 1993 to November 1993. It also announces a new Coordinated Research Programme entitled "Improved Diagnosis and Control of Foot-and-Mouth Disease in South East Asia Using ELISA-Based Technologies". Applications for participation in this Programme should be sent to the IAEA and should arrive by 31 May 1994.

13212 (INIS-mf–13821) **Soils newsletter. V. 16, no. 2.** Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria). Dec 1993. 33p. Order Number DE94619300. Source: OSTI; NTIS (US Sales Only); INIS.

This newsletter summarizes the status of ongoing Co-ordinated Research Programmes and reports on Meetings and workshops held between May 1993 to December 1993. The descriptions of two meetings, on the assessment of irrigation schedules of field crops to increase the effective use of water in irrigation products and on the improvement and yield of grain legumes with the aim of increasing food production and saving N fertilizer in the tropics and sub-tropics of Asia, are fairly detailed and include excerpts from presented papers.

13213 (INIS-mf–13852) **Foodstuffs preservation by ionization.** Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

This document contains all the papers presented at the meeting on foodstuffs preservation by ionization. These papers deal especially with the food ionization process, its development and the view of the food industry on ionization. Refs and figs (F.M.).

13214 (INIS-mf–13852, pp. 17-20) **Production and processing of foodstuffs of animal origin in Morocco.** Belemlih, A. Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

This paper reports the situation of the animal productions in Morocco. The author concludes that foodstuffs of animal origin are especially eaten fresh, the level of this consumption is low and the

problems related to the food processing and distribution are somewhat elementary: that is particularly question of problems of hygiene, of wholesomeness and of organisation. (F.M.).

13215 (INIS-mf–13852, pp. 21-34) **Food disinfection and preservation by ionization.** Saint-Lebe, L. Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

The author gives a general outline of the ionization process including its major positive effects on living organisms contaminating food and its minor negative effects on food components. Research in toxicological evaluation has shown that irradiated food do not present any toxicity. Therefore, the irradiation process is currently used in the sectors of dried, dehydrated or frozen products. It remains to develop the use of the irradiation in the sector of fresh products. 4 figs., 1 tab.(F.M.).

13216 (INIS-mf–13852, pp. 35-48) **Ionization applications in food industry - Generalities.** Boisseau, P. Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

This paper outlines different applications of the ionization in food treatments and their purposes. Irradiation of food with low doses (below 1 kgy) is used for germination inhibition, insects sterilization, disinfestation and senescence delays. Applications with medium doses (from 1 to 10 kgy) are used for extension of shelf life, elimination of pathogenic microorganisms and improving technological properties. Applications with high doses (superior to 10 Kgy) are used for food sterilization, only in some specific cases. Necessary doses in various applications of food ionization are given as well as minimal doses for food sterilization. In some cases where treatment of food by only ionization do not permit to attain the fixed object, ionizing treatment is combined with an other type of treatment as: refrigeration, heat treatments, packing, dehydration and chemical treatments. 3 tabs., 5 refs. (F.M.).

13217 (INIS-mf–13852, pp. 49-55) **Project of introducing irradiation methods into food preservation in Morocco.** R'kiek (Institut National de la Recherche Agronomique, Casablanca, (Morocco)). Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

Morocco has an agricultural vocation and its productions are diversified. Besides the production intended for local consumption, a large part is exported to different countries and represents an important income of currency for the country. In spite of the use several food treatment methods: modern and traditional, the loss caused by different parasites remains more than 27% of national production. To reduce this loss and extend the shelf life, it is necessary to opt for food preservation by irradiation. This technique is used in many countries both industrialized and developing with satisfactory results. For this purpose, a decree regulating food irradiation has been elaborated. Before using this process in the industrial field, it is indispensable to start with a 'research' phase. The 'Station Centrale des Radio-Elements', SCRE of the 'Institut National de la Recherche Agronomique', INRA has been charged with achieving this phase and submitted food irradiation project to the IAEA. After several meetings and steps taken by the INRA and the 'Direction de la Protection de Vegetaux, du Controle de Semence et Repression des Fraudes' with the IAEA, the project was approved. The SCRE is presented in this paper. 2 tabs.(F.M.).

13218 (INIS-mf–13852, pp. 57-63) **Conditions for introducing irradiation processing methods in Morocco.** Alami, R. (Centre National de l'Energie, des Sciences et des techniques Nucleaires, Rabat (Morocco)). Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

To introduce irradiation methods into foodstuffs preservation in Morocco, it is necessary to start with the following stages: -establishment of a national regulation; -public information on food irradiation; -setting up of a competent structure charged with seeing to respect of norms and controlling the treated products quality. The Centre National de l'Energie, des Sciences et des Techniques Nucleaires (CNESTEN) is decided to support such a program. 4 Refs., 3 figs. (F.M.).

13219 (INIS-mf–13852, pp. 65-76) **View of food industry on acceptance of food irradiation.** Moog, M.P. Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

Food processing with irradiation improve food quality, extend shelf life, reduce losses, but how make this process acceptable and interesting to food industries? In France the 'Association pour la promotion de l'industrie et de l'agriculture (APRIA)' has achieved qualitative and quantitative studies on the acceptability of food irradiation to french industrialists and consumers. Their views are opposing: the food industries consider the food irradiation as technology ahead of its time. The consumer is frightened by such a process which do not change or change slightly the product. This paper reports the analysis and the content of the french industry speech and the public opinion on food preservation methods notably food irradiation. The factors of food irradiation acceptance are discussed and recommendations are given. 1 fig. (F.M.).

13220 (INIS-mf–13852, pp. 88-95) **Characteristics of ionizing radiations used in food.** Nourreddine, A. Association des Ingenieurs en Genie Atomique du Maroc, Casablanca (Morocco). Dec 1991. 95p. (In French). (CONF-9104430–: Foodstuffs preservation by ionization meeting, Casablanca (Morocco), 20 Apr 1991). In *Foodstuffs preservation by ionization.* Order Number DE94620779. Source: OSTI; NTIS (US Sales Only); INIS.

This paper highlights the ionization phenomenon, the classification of ionizing radiations, the interaction photon-matter, application of irradiation technique and sources of ionizing radiations used in food processing. The characteristics of these sources are given. 2 figs; 1 tab. (F.M.).

13221 (NEI-FI–214, pp. 135-144) **Agricultural programs for energy: High margin coproducts strategy.** Villet, R.H. (U.S. Department of Agriculture, Belstville (United States). Office of Technology Transfer). Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab. 1993. (CONF-9209243–: Advisory group meeting on nuclear data requirements for fission reactor decommissioning, Vienna (Austria), 7-11 Sep 1992). In *Biofuels workshop II.* 409p. Order Number DE94722037. Source: OSTI; NTIS.

The Agricultural Research Service (ARS) is the in-house research arm of the U.S. Department of Agriculture (USDA). The research program bias is toward crop production, the historical focus of agricultural research. There is, however, an existing realization that, in order to maintain and strengthen the competitiveness of the United States in global agriculture, new uses must be found, developed, and commercialized for raw bulk agricultural commodities such as maize (corn), soybeans, and wheat. Biofuels such as ethanol from cornstarch, and biodiesel from soybean oil are being promoted strongly as a way of utilizing agricultural commodities more profitably to the farmer. Over the years, ARS has maintained a bioenergy program which has had fluctuating support, and thus a variation in dimensions. At present, there is strong political and departmental backing; in fact there is a fruitful collaboration being developed between the USDA and the U.S. Department of Energy through a Memorandum of Understanding. Ethanol from starch and other less tractable forms of biomass have been subjected to a barrage of economic evaluations, not exactly overoptimistic. In these studies, the large contribution by feedstock cost to the overall cost of production is pointed out. This has led to

research programs on biomass production and also attempts at lowering costs of ethanol production by improved pretreatment, conversion, and product recovery. Progress toward lowering production costs has been undeniable, but slow.

13222 (NIRS-M–93, pp. 60-69) **Global deposition of fallout radionuclides and their dietary intake: Discussions on strontium-90.** Morisawa, Shinsuke (Kyoto Univ. (Japan). Dept. of Environmental and Sanitary Engineering). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Japanese foods depend largely on foreign countries and domestic food supply now is no more than 30 percents if feedstuffs for live-stocks are included. Therefore not only ecological/natural but also social, e.g., human activities related, transportation of fallout radionuclides are to be taken into accounts for estimation of baseline internal irradiation dose and health risks of Japanese peoples through dietary intake of radionuclides. In this study, mathematical model is developed and examined for practical application on estimating Japanese dietary intake level of fallout strontium-90, which is accumulated in various kinds of foodstuffs and is transported to Japan associated with worldwide trades of foods, under appropriate limitations such that direct deposition on plants and seafood intake pathways are not evaluated. Deposition of strontium-90 onto the surface soil was simulated using the model, the compartment model described by a set ordinary differential equations, and the estimates were examined by comparing them with the observed data colleted and complied by the global scale environmental monitoring networks. Sensitivity analysis is also practised to find possible reduction of dietary intake of fallout radionuclides and the related potential health risks. (author).

13223 (NIRS-RSD–101) **Radioactivity survey data in Japan, part 2: Dietary materials.** National Inst. of Radiological Sciences, Chiba (Japan). Jun 1993. 39p. Order Number DE94748691. Source: OSTI; NTIS; INIS.

The publication is aimed at providing radioactivity survey data in Japan. Part 2 covers dietary materials, including total diet, rice, milk, powdered milk, vegetables, tea, sea fish, freshwater fish, shellfish, and seaweeds. Samples were collected from 42 locations during the period between March 1991 and March 1992, and were sent to the Japan Chemical Analysis Center for radiochemical analysis. Strontium-90 and cesium-137 in these dietary materials are tabulated. The maximum concentrations of strontium-90 and cesium-137 were 0.16 ± 0.016 Bq/p · d and 0.20 ± 0.013 Bq/p · d, in total diet; 0.023 ± 0.011 Bq/kgwet and 0.18 ± 0.012 Bq/kgwet in rice; 0.071 ± 0.0095 Bq/l and 0.50 ± 0.019 Bq/l in milk; 0.50 ± 0.016 Bq/kgwet and 0.23 ± 0.016 Bq/kgwet in vegetables; 0.027 ± 0.0090 Bq/kgwet and 0.22 ± 0.015 Bq/kgwet in sea fish; 2.6 ± 0.04 Bq/kgwet and 0.27 ± 0.017 Bq/kgwet for freshwater fish; 0.020 ± 0.013 Bq/kgwet and 0.041 ± 0.0079 Bq/kgwet in shellfish; 0.046 ± 0.0054 Bq/kgwet and 0.037 ± 0.0072 Bq/kgwet in seaweeds, respectively. Annual changes in the concentrations of both strontium-90 and cesium-137 from 1987 through 1991 are given. (J.P.N.).

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

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5601 Radiation Effects

Refer also to citation(s) 11751, 11814, 11836, 11837, 11838, 11856, 11866, 11873, 11886, 12202, 12668, 13061, 13128, 13135, 13151, 13161, 13176, 13196, 13222, 13320, 13824, 13842, 14150

13224 (AECL–10230) **Proceedings of a Workshop on Genetic Effects of Ionizing Radiation.** TerMarsch, D.J. (Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.); Gentner, N.E. Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.; Atomic Energy Control Board, Ottawa, ON (Canada); Atomic Energy Control Board, Ottawa, ON (Canada). Advisory Committee on Radiological Protection. 1990. 84p. (CONF-9005454–: Workshop on Genetic Effects of Ionizing Radiation, Ottawa (Canada), 2 May 1990). Order Number DE94613216. Source: OSTI; NTIS (US Sales Only); INIS.

Nine papers were presented at this workshop held to mark the retirement of Dr. D.K. Myers. The papers reviewed recent literature on the heritable effects of ionizing radiation and identified areas of uncertainty. (L.L.).

13225 (BfS-ST–3/92) **2. biophysical work meeting: Papers.** Bundesamt fuer Strahlenschutz, Berlin (Germany). Fachbereich Strahlenschutz. Nov 1992. 153p. (In German). (CONF-9109531–: 2. biophysical work meeting, Schlema (Germany), 11-13 Sep 1991). Order Number DE94752427. Source: OSTI; NTIS (US Sales Only); INIS.

The report comprises 18 papers held at the 2nd Biophysical Work Meeting, 11 - 13 September 1991 in Schlema, Germany. The history of biophysics in Germany particularly of radiation biophysics and radon research, measurements of the radiation effects of radon and the derivation of limits, radon balneotherapy and consequences of uranium ore mining are dealt with. (orig.)

13226 (BNL–49779) **Microdosimetry of monoenergetic neutrons.** Srdoc, D. (Brookhaven National Lab., Upton, NY (United States)); Marino, S.A. Brookhaven National Lab., Upton, NY (United States); Columbia Univ., New York, NY (United States). [1993]. 29p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);International Atomic Energy Agency, Vienna (Austria). DOE Contract AC02-76CH00016 ; AC02-78EV04733. Grant CA-12536; Grant CA-13696. Order Number DE94007520. Source: OSTI; NTIS; INIS; GPO Dep.

Tissue spheres 0.25, 0.5, 1.0, 2.0, 4.0, and 8.0 μm in diameter were simulated using a wall-less spherical counter filled with a propane-based tissue-equivalent gas. Microdosimetric spectra corresponding to these site sizes were measured for five neutron energies (0.22, 0.44, 1.5, 6, and 14 MeV) and the related mean values $\bar{Y}_F$ and $\bar{Y}_D$ were calculated for several site sizes and neutron energies. An elaborate calibration technique combining soft x-rays, a ^{55}Fe photon source, and a ^{244}Cm collimated source of alpha particles was used throughout the measurement. The spectra and their mean values are compared with theoretically calculated values for ICRU tissue. The agreement between the calculated and the measured data is good in spite of a systematic discrepancy, which could be attributed, in part, to the difference in elemental composition between the tissue-equivalent gas and plastic used in the counter, and the ICRU standard tissue used in the calculations.

13227 (DOE/EH–0364T) **Occupational dose reduction at Department of Energy contractor facilities: Bibliography of selected readings in radiation protection and ALARA; Volume 5.** Dionne, B.J. (Brookhaven National Lab., Upton, NY (United States)); Sullivan, S.G.; Baum, J.W. USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health; Brookhaven National Lab., Upton, NY (United States). Jan 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL–43228-Vol.5). Order Number DE94007247. Source: OSTI; NTIS; INIS; GPO Dep.

Promoting the exchange of information related to implementation of the As Low as Reasonably Achievable (ALARA) philosophy is a continuing objective for the Department of Energy (DOE). This report was prepared by the Brookhaven National Laboratory (BNL) ALARA Center for the DOE Office of Health. It contains the fifth in a series of bibliographies on dose reduction at DOE facilities. The BNL ALARA Center was originally established in 1983 under the sponsorship of the Nuclear Regulatory Commission to monitor dose-reduction research and ALARA activities at nuclear power plants. This effort was expanded in 1988 by the DOE's Office of Environment, Safety and Health, to include DOE nuclear facilities. This bibliography contains abstracts relating to various aspects of ALARA program implementation and dose-reduction activities, with

a specific focus on DOE facilities. Abstracts included in this bibliography were selected from proceedings of technical meetings, journals, research reports, searches of the DOE Energy, Science and Technology Database (in general, the citation and abstract information is presented as obtained from this database), and reprints of published articles provided by the authors. Facility types and activities covered in the scope of this report include: radioactive waste, uranium enrichment, fuel fabrication, spent fuel storage and reprocessing, facility decommissioning, hot laboratories, tritium production, research, test and production reactors, weapons fabrication and testing, fusion, uranium and plutonium processing, radiography, and accelerators. Information on improved shielding design, decontamination, containments, robotics, source prevention and control, job planning, improved operational and design techniques, as well as on other topics, has been included. In addition, DOE/EH reports not included in previous volumes of the bibliography are in this volume (abstracts 611 to 684). This volume (Volume 5 of the series) contains 217 abstracts.

13228 (DOE/ER/60417–8) **Fast neutron dosimetry: Progress report, 30 August 1992–1 September 1993.** DeLuca, P.M. Jr.; Pearson, D.W. Wisconsin Univ., Madison, WI (United States). Dept. of Medical Physics. [1993]. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER60417. Order Number DE94003611. Source: OSTI; NTIS; INIS; GPO Dep.

Research concentrated on three major areas during the last twelve months: (1) investigations of energy fluence and absorbed dose measurements using crystalline and hot pressed TLD materials exposes to ultrasoft beams of photons, (2) fast neutron kerma factor measurements for several important elements as well as NE-213 scintillation material response function determinations at the intense "white" source available at the WNR facility at LAMPF, and (3) kerma factor ratio determinations for carbon and oxygen to A-150 tissue equivalent plastic at the clinical fast neutron radiation facility at Harper Hospital, Detroit, MI. Progress summary reports of these efforts are given in this report.

13229 (DOE/ER/60507–7) **Radiogenic neoplasia in thyroid and mammary clonogens: Progress report, January 1, 1993–December 31, 1993.** Clifton, K.H. Wisconsin Univ., Madison, WI (United States). Dept. of Human Oncology. 30 Jul 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER60507. Order Number DE94004163. Source: OSTI; NTIS; INIS; GPO Dep.

The induction of cancer by ionizing radiation is a matter of great practical importance to the nuclear industry, to national defense, to radiological medicine and to the general public. It is increasingly apparent that carcinogenesis is one of the leading dose-limiting effects of radiation exposure (Co90). Quantitative information at the cellular level is essential to an understanding of the mechanisms of radiogenic neoplastic initiation and the stages of promotion and progression to overt neoplasia. We have developed two experimental models, the rat thyroid and rat mammary clonogen transplant systems, for the quantitative study of radiation carcinogenesis at the cellular level in vivo (C185). The most important steps taken or completed during the current grant year include: (a) demonstration of the high age-dependent radiosensitivity of prepubertal rat mammary clonogens to radiogenic damage which may influence their susceptibility to neoplastic initiation, and (b) demonstration of the feasibility of using a molecular test for clonogenicity in which Simple Sequence Repeats in the DNA serve as identifying signals of the genotypic origin of the cells. We have also (c) set up a large carcinogenesis experiment to test the effect of close intercellular contact in thyroid glands in situ on promotion-progression of radiogenically initiated clonogens, (d) achieved considerable further concentration of thyroid clonogens, and (e) begun to explore whether thyroid cells can be induced to give rise to three dimensional multicellular structures in culture in reconstituted basement membrane. These are discussed in this report.

13230 (DOE/ER/60524–7) **Malignant transformation of human fibroblasts by neutrons and by gamma radiation: Relationship to mutations induced: Progress report, [January 1, 1993–December 31, 1993].** McCormick, J.J. Michigan State Univ., East Lansing, MI (United States). Carcinogenesis Lab. [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER60524. Order Number DE94002671. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of this study is to determine whether there is an inverse dose rate effect for cell transformation of human cells treated with ionizing radiation and/or neutron radiation. The initial finding of an inverse dose effect on transformation of C3H/10T$\frac{1}{2}$ cells by neutron radiation by Elkind and his colleagues was treated with skepticism, but studies with C3H/10T$\frac{1}{2}$ cells by Hall and colleagues, as well as others, have verified the finding. However, not all studies have found such an effect when using C3H/10T$\frac{1}{2}$ cells. A further problem is that the C3H/10T$\frac{1}{2}$ cell line itself gives a very high induced transformation up to 3%. This would appear not to be compatible with a genetic change. Yet, the current theory regarding carcinogenesis supported by almost all recent studies is that a cancer cell results from the "activation" of appropriate proto-oncogenes and/or the inactivation of appropriate suppressor genes within a single cell, i.e., genetic changes. Thus, the possibility exists that the inverse dose effect phenomeria is peculiar to C3H/10T$\frac{1}{2}$ cells. This possibility must be seriously considered since the C3H/10T$\frac{1}{2}$ transformation assay has been in existence for 20 years, but the mechanism by which the cells become transformed have not yet been successfully elucidated.

13231 (DOE/ER/60660–T1) **Yields of biologically significant damage produced in mammalian DNA by irradiation associated with radon decay: Final progress report.** Ward, J.F. California Univ., San Diego, La Jolla, CA (United States). Dept. of Radiology. [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-88ER60660. Order Number DE94008177. Source: OSTI; NTIS; GPO Dep.

The objective of this project was to characterize the difference between damage to DNA caused by alpha particles and by low LET radiation. Estimation of the risk posed by exposure to high LET radiation (such as that from radon) relies at present on epidemiological data, and is therefore largely empirical. This empiricism is evident from the concepts of quality factor or RBE that find use for describing the biological effects of high LET radiation. The author argues that some effort should be made to address the mechanisms of DNA damage by high and low LET forms of radiation, and how these mechanisms might relate to the biological endpoints. This report summarizes the results of the author's investigations and the current understanding of these mechanisms.

13232 (DOE/FTR–94000733) **Improved techniques for assessment of internal radiation dose from occupational radiation exposures and medically administrated radionuclides: Foreign trip report, September 11, 1993–September 23, 1993.** Fisher, D.R. Pacific Northwest Lab., Richland, WA (United States). 22 Oct 1993. 25p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94000733. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report describes foreign travel by Dr. Darrell R. Fisher, Staff Scientist in Pacific Northwest Laboratory's Health Physics Department. The primary purpose of this travel was to attend the Workshop on Intakes of Radionuclides: Detection, Assessment and Limitation of Occupational Exposure, September 13–17, 1993, in Bath, England. ion of the European Communities (CEC) Directorate General for Science, Research and Development, Radiation Protection Research Action, and by the US Department of Energy (DOE) Office of Health and Environmental Research. The traveler presented a scientific paper at the Workshop on Intakes of Radionuclides entitled, "Assessment of Accidental Intakes of Uranyl Acetylacetonate (UAA)" (PNL-SA-21948). A copy of the full text is attached to this report. A secondary purpose of the trip was to meet with staff of the Radiation Physics Institute of the University of Lund, Sweden, September 18–22, 1993, to learn more about Swedish methods for assessing medical internal radiation dose from systemically administered radionuclides.

13233 (ETDE-IT–94-21) **C3H10T1/2 cell transformation after fractionated doses of neutrons of different energies.** Saran, A.

(ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Coppola, M.; Di Majo, V.; Rebessi, S.; Pazzaglia, S.; Pariset, L.; Covelli, V.; Broerse, J.J.; Zoetelief, H. No corporate text available. 1992. 5p. Order Number DE94752540. Source: OSTI; NTIS (US Sales Only).

Earlier in vivo and in vitro studies of carcinogenesis, life shortening, and oncogenic transformation induced by high-LET radiation indicated either increased effectiveness or no change in effectiveness after dose protraction. As most occupational exposures are at low dose rates or by small dose fractions, risk assessment requires the evaluation of the dose-rate effect. Recently several experiments have been performed with the batch of C3H10T1/2 cells available at our laboratory to detect the influence of dose fractionation on neoplastic transformation induced by neutron irradiation. This paper reports the result of the most recent experiments, and also summarizes for comparison purposes data from the previous work.

13234 (ETDE-IT–94-34) **Radiobiological aspects of radiotherapy treatment planning.** Mauro, F. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Benassi, M. No corporate text available. Mar 1993. 39p. (CONF-9109533–1: International workshop on recent advances in human radiobiology, Ferrara (Italy), 19 Sep 1991). Order Number DE94752597. Source: OSTI; NTIS (US Sales Only).

The aim of an oncological treatment is to eradicate the tumor without inducing unacceptable side effects. The optimization of a dose distribution with external beams requires the selection of the radiation type and energy, the number of fields, their sizes and incidence angles of the beams and then the possible use of wedges or compensating filters. The goal of optimal treatment planning is to provide maximum tumor killing while sparing normal tissues as much as possible. New, more sophisticated planning systems, based on three dimensional dose distribution calculations, require simplified data interpretation techniques. Dose volume histograms represent a convenient and useful tool to summarize dose distribution information through the entire volume of a given anatomic structure and to quickly highlight characteristics such as dose uniformity and hot and cold spots. It is difficult however to choose among competing histograms concerning different organs when they cross one another. This paper discusses the development of a computerized treatment planning system in which dose volume histograms are used to estimate tumor control and normal tissue complication probabilities.

13235 (FOA-C–40306-4.3) **Building for animal production.** Andersson, Inger (Swedish Univ. of Agricultural Sciences, Alnarp (Sweden)); Ulvsand, T.; Hansson, J.; Dolby, C.M. National Defence Research Establishment, Umeaa (Sweden). Feb 1993. 66p. (In Swedish). Project SSI-P–624-91. Order Number DE94615974. Source: OSTI; NTIS; INIS.

In order to limit the radiation dose to persons working with animal husbandry in severe fallout situations, it was considered necessary to make an inventory of the Swedish livestock buildings as to number, location, use and size. These data as well as data on geometry of buildings, building material and thickness of the material in walls and roofs are given in the present work. On the basis of the mentioned data, calculations were made of the shielding factors of different types of livestock buildings. The collected data can also be used in preparedness planning in relation to housing facilities for livestock and location and size of animal production in situations of crises or war. The calculations show shielding factors for different types of livestock buildings of normal ground area within the range of 0.18-0.71. The higher value indicates a fairly poor shielding effect. The inventory and the calculations show that in those regions in Sweden where the main part of the livestock is managed, the types of buildings are, however, characterized by radiation shielding factors of 0.3-0.4. Calculation were also made of the radiation level inside the buildings following decontamination of roofs or of surrounding ground. Ground decontamination only, i.e., removal of the upper contaminated surface layer, will reduce the radiation level inside the building. For most buildings the radius of the surrounding area to be decontaminated has to be 15-30 times larger than the width of the building in order to achieve a 50 percentage reduction of the radiation level inside the building. For buildings of medium or large size and with thick walls the radiation contribution from the roof is greater than the radiation from the ground, and regardless of the size of the ground areas decontaminated the radiation level inside these buildings will only be reduced by 20-30%. 15 refs, 11 figs, 14 tabs.

13236 (GSF–8/93) **Investigations into the effect of stable iodine administration to cows on the transfer of iodine-131 from the food to the cow's milk: Final report.** Voigt, G. (GSF - Forschungszentrum fuer Umwelt und Gesundheit Neuherberg GmbH, Oberschleissheim (Germany). Inst. fuer Strahlenschutz); Probstmeier, G.; Roehrmoser, G. GSF - Forschungszentrum fuer Umwelt und Gesundheit GmbH, Neuherberg (Germany). Mar 1993. 32p. (In German). Sponsored by Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). Project Number BMU St.Sch.4036. Order Number DE94752447. Source: OSTI; NTIS (US Sales Only); INIS.

The investigations were carried out with the aim to quantify the effects of stable iodine taken up in various concentrations with the food on the rates of radioactive iodine-131 eliminated in the milk. The experiments clearly pointed to the fact that variations in iodine uptake had no effect on elimination rates for milk cows generally receiving large amounts of stable iodine due to generous additions to the mineral mixtures and grazing of cattle in well fertilized meadows, which is the usual practice also on German farms. This was evident from the determined milk transfer factors, which invariably remained in the range of 0.015 ± 0.002 d/L and bore no relation to the added concentrations of stable iodine (10 and 100 mg/d). The finding appears to render superfluous any warnings to reduce those iodine supplies in order to offset increased milk loads resulting from accidents, technical mishaps and radioactive iodine fallouts from nuclear plants. The only exception are cows kept in low supply areas, where stable iodine is not added to food concentrates or mineral mixtures. Here, it appears likely that the addition of stable iodine to the food would have a detectable effect on the elimination rates. (orig./MG)

13237 (HW–61082) **Radioactive particles in the 234-5 Building ventilation exhaust.** Postma, A.K.; Schwendiman, L.C. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 13 Jul 1959. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94007886. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The 234-5 Building ventilation exhaust is continuously sampled for the purpose of estimating the amount of radioactive (alpha emitting) material discharged to the atmosphere. Although a record is kept of the gross amount of radioactive material discharged, few data are available concerning the size and kind of active particles in the exhaust air. Knowledge of the particle size permits: (1) an estimate of the validity of samples drawn through the sampling system, (2) a better knowledge of what the active particle ground deposition pattern might be, and (3) may provide information relating to filter performance. The kind of radioactive material discharged is important in determining relative health hazards. The object of this work was to determine the size and kind of radioactive particles in the 234-5 Building ventilation exhaust. A secondary objective was to review present routine sampling of the stream with particular regard to the particulates to be sampled.

13238 (IAEA-TECDOC–718) **A model national emergency response plan for radiological accidents.** International Atomic Energy Agency, Vienna (Austria). Sep 1993. 38p. Order Number DE94615975. Source: OSTI; NTIS (US Sales Only); INIS.

The IAEA has supported several projects for the development of a national response plan for radiological emergencies. As a results, the IAEA has developed a model National Emergency Response Plan for Radiological Accidents (RAD PLAN), particularly for countries that have no nuclear power plants. This plan can be adapted for use by countries interested in developing their own national radiological emergency response plan, and the IAEA will supply the latest version of the RAD PLAN on computer diskette upon request. 2 tabs.

13239 (IC–93/343, pp. 2) **The physico-chemical basis of self-organization.** Ponnamperuma, C. (Maryland Univ., College Park, MD (United States)). International Centre for Theoretical

Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. POLYPEPTIDES/biological evolution; BIOSYNTHESIS; GENETICS; POLYPEPTIDES

13240 (IC–93/343, pp. 3) **Energy, matter and self-organization in the early molecular evolution of bioenergetic systems.** Baltscheffsky, H. (Stockholm Univ. (Sweden). Dept. of Biochemistry); Baltscheffsky, M. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ATP/biological evolution; ATP; METABOLISM; PYROPHOSPHATES

13241 (IC–93/343, pp. 4) **Archaebacteria: Key organisms for the study of the early evolution of life.** Oshima, T. (Tokyo Inst. of Technology, Nagatsuta, Yokohama (Japan). Dept. of Life Sciences). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BACTERIA/biological evolution; BACTERIA; RIBOSOMAL RNA; THERMOPHILIC CONDITIONS

13242 (IC–93/343, pp. 5) **The initiation of biological processes on earth: Summary of empirical evidence.** Schidlowski, M. (Max-Planck-Institut fuer Chemie (Otto-Hahn-Institut), Mainz (Germany)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/age estimation; BACTERIA; CARBON CYCLE; CARBON DIOXIDE FIXATION; CARBON ISOTOPES; ISOTOPE RATIO

13243 (IC–93/343, pp. 6) **The weak force and the origin of chirality and self-organization.** MacDermott, A.J. (Oxford Univ. (United Kingdom). Physical Chemistry Lab.). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/chirality; BIOCHEMISTRY; CHIRALITY

13244 (IC–93/343, pp. 8) **Electroweak interactions and chirality of aminoacids.** Bakasov, A.A. (International Centre for Theoretical Physics, Trieste (Italy)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMINO ACIDS/configuration interaction; BIOLOGICAL EVOLUTION; CHIRALITY; MOLECULAR STRUCTURE

13245 (IC–93/343, pp. 10) **Role of nitriles and other reactive molecules in chemical evolution.** Chadha, M.S. (Bhabha Atomic Research Centre, Bombay (India)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/nitriles; ANABOLISM; NITRILES

13246 (IC–93/343, pp. 11) **Molecular relics from chemical evolution and the origin of life.** Chela Flores, J. (International Centre for Theoretical Physics, Trieste (Italy)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION; MAGNOLIOPHYTA/biological evolution; MAGNOLIOPHYTA; NUCLEIC ACID REPLICATION; RNA

13247 (IC–93/343, pp. 12) **Comets as "Sowers" of prebiotic molecules in the galaxy.** Cosmovici, C.B. (Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Ist. di Fisica dello Spazio). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 6 refs. BIOLOGICAL EVOLUTION/comets; COMETS; ORGANIC COMPOUNDS

13248 (IC–93/343, pp. 13) **Fluorescence imaging of replicating RNA in capillaries.** Dapprich, J. (Institut fuer Molekulare Biotechnologie, Jena (Germany)); McCaskill, J.; Voelker, S.; Krause, F. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RNA/nucleic acid replication; FLUORESCENCE; RNA; TUBES

13249 (IC–93/343, pp. 14-17) **On attempts to create life-mimicking cells.** Eirich, F.R. (Polytechnic Univ., Brooklyn, NY (United States)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/biological models; BIOLOGICAL MATERIALS; CELL MEMBRANES; NUCLEIC ACID REPLICATION; POLYPEPTIDES

13250 (IC–93/343, pp. 18) **Membrane phase separations, asymmetry and implications in the origin of life.** Eze, M.O. (Nigeria Univ., Nsukka (Nigeria). Dept. of Biochemistry). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CELL MEMBRANES/biological evolution; ASYMMETRY; ESCHERICHIA COLI

13251 (IC–93/343, pp. 19) **Chiral interaction in molecular systems.** Gilat, G. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMINO ACIDS/biological evolution; CHIRALITY; INTERACTIONS

13252 (IC–93/343, pp. 20) **Computational support for origins of life research.** Hobish, M.K. (Maryland Univ., College Park, MD (United States). Dept. of Computer Science). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/mathematical models; COMPUTERS

13253 (IC–93/343, pp. 21) **Formation of amino acid precursors by cosmic radiation in primitive terrestrial and extraterrestrial environments.** Kobayashi, K. (Yokohama National Univ., Yokohama (Japan). Dept. of Physical Chemistry); Saito, T.; Oshima, T. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. Grant 05833007. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMINO ACIDS/biological evolution; CHEMICAL RADIATION EFFECTS; COSMIC RADIATION

13254 (IC–93/343, pp. 22) **Cosmological sources of molecular chirality.** Kumar, N. (International Centre for Theoretical Physics, Trieste (Italy)); Chela Flores, J. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMINO ACIDS/chirality; CHIRALITY; BIOLOGICAL EVOLUTION; MATHEMATICAL MODELS; WEINBERG LEPTON MODEL

13255 (IC–93/343, pp. 23) **Hydrogen cyanide polymers: Prebiotic agents for the origin and self-organization of proteins and nucleic acids.** Matthews, C.N. (Illinois Univ., Chicago, IL (United States). Dept. of Chemistry). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/hydrocyanic acid; ANABOLISM; NUCLEIC ACIDS; ORGANIC POLYMERS; POLYPEPTIDES

13256 (IC–93/343, pp. 24) **Randomness, determinism, thermodynamics and evolution.** Mohan, R. (Max-Planck-Institut fuer Biophysikalische Chemie (Karl-Friedrich-Bonhoeffer-Institut), Goettingen (Germany)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ORGANIC POLYMERS/biological evolution; RANDOMNESS

13257 (IC–93/343, pp. 26) **On Dyson's model of the origins of life and possible experimental verification.** Islam, J.N. (Chittagong Univ., Chittagong (Bangladesh). Research Centre for Mathematical and Physical Sciences); Pasha, M.K. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION; AMINO ACIDS; ANABOLISM; NUCLEIC ACIDS; PROTEINS

13258 (IC–93/343, pp. 27) **Gradual rise of cellular translation.** Rizzotti, M. (Padua Univ., Padova (Italy). Dipt. di Biologia). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION; NUCLEOTIDES; ORGANIC POLYMERS

13259 (IC–93/343, pp. 31) **Origin of biochirality - A beautiful theory, but nasty experiments?.** Thiemann, W. (Bremen Univ. (Germany)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BIOLOGICAL EVOLUTION/chirality; CHIRALITY; STEREOCHEMISTRY

13260 (IC–93/343, pp. 32) **Finding necessary condition and scope of surviving L-amino acid under beta electron irradiation.** Wang, W.Q. (Beijing Univ., BJ (China)); Wu, J.L.; Pan, X.M.; Luo, L.F. International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AMINO ACIDS/chirality; CHIRALITY; BETA PARTICLES; BIOLOGICAL EVOLUTION; CHEMICAL RADIATION EFFECTS; ELECTRONS; INELASTIC SCATTERING

13261 (INFO–0424) **Occupational exposure of fathers to ionizing radiation and the risk of leukaemia in offspring: A case-control study.** McLaughlin, J.R. (Ontario Cancer Treatment and Research Foundation, Ottawa, ON (Canada)); Clarke, E.A.; Anderson, T.W.; King, W. Atomic Energy Control Board, Ottawa, ON (Canada). Aug 1992. 72p. (In English, French). Project 7.157.1. Order Number DE94613218. Source: OSTI; NTIS (US Sales Only); INIS.

An epidemiologic study was performed to determine whether there was an association between childhood leukaemia and the occupational exposure of fathers in the nuclear industry to ionizing radiation prior to the child's conception. The study employed a case-control design. Children with cancer ('cases') and children who did not develop cancer ('controls') were compared with respect to their exposure history. The cases, which from 1950 to 1988, consisted of children aged 0 to 14 years who died from or were diagnosed with leukaemia and were born to mothers who

lived near an operating nuclear facility in Ontario. Eight controls were matched to each case according to date of birth and mother's residence. There were 112 cases and 890 controls. Data on the occupational exposure of the 1002 fathers were obtained from the Canadian National Dose Registry (NDR) and employer records. Links to the NDR were found for 95 fathers. For each father doses were obtained regarding whole body external dose, tritium dose, and (for uranium miners) internal exposures to the lungs due to radon and radon daughters. Radiation exposures were estimated (a) over the father's lifetime before the child's conception; (b) during the six months prior to the child's conception; (c) during the three months prior to the child's conception; and (d) over the father's lifetime, ending in the month of the child's diagnosis. There was no evidence of an elevated leukaemia risk in relation to any exposure period or exposure type, and there was no apparent gradient of effect with increasing radiation dose. It is concluded that there was no association between childhood leukaemia and the occupational exposure of fathers to ionizing radiation prior to conception or diagnosis. Odds ratios were close to 1.0 for all radiation dose categories and occupations except for uranium mining, which had a larger but not statistically significant odds ratio. (L.L.) (75 refs., 14 tabs., 7 figs.).

13262 (INIS-BR–3266) **Experimental determination of the radiation dose distribution in heterogeneous medium submitted to gamma and x-rays.** Rocha, J.R.O. Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica. 1988. 113p. (In Portuguese). Order Number DE94617892. Source: OSTI; NTIS (US Sales Only); INIS.

An experimental study of the perturbation caused by a cylindrical inhomogeneity on dose distribution in a water phantom, irradiated by high energy photons was performed, employing radiographic film as dosimeter. These materials were used to simulate the interface between bone and muscular tissue. (author).

13263 (INIS-GB–583) **HSE statement on the approval of dosimetry services.** Health and Safety Executive, London (United Kingdom). Sep 1992. 6p. Order Number DE94619345. Source: OSTI; NTIS (US Sales Only); INIS.

This statement is intended to assist dosimetry services who may wish to be approved by the U.K. Health and Safety Executive under Regulation 15 of the Ionising Radiations Regulations 1985. It also serves to inform approved dosimetry services of changes in the arrangements which HSE makes for approval and reassessment of dosimetry services. A general description of the administrative arrangements for making application is given and the subsequent processing of such applications by the HSE is outlined. Background notes on the requirements of the Regulations are given in Appendix I. The fees which are chargeable from 20/8/92 are given in Appendix II. (Author).

13264 (INIS-GB–585) **General guidance for laboratories providing personal dosimetry services.** Health and Safety Executive, London (United Kingdom). 1991. 8p. Order Number DE94619347. Source: OSTI; NTIS (US Sales Only); INIS.

This guidance is recommended to all dosimetry services in the interests of good radiation protection practice. For dosimetry services who seek approval under the Ionising Radiation Regulations 1985, the Health and Safety Executive (HSE) would invoke compliance with this guidance, in broad terms, as well as other published guidance. The recommendations include sections concerning laboratory organizations and staff, documentation of procedures, laboratory accommodation and services, equipment, calibration and traceability, housekeeping, dosimetric capability, laboratory records. (Author).

13265 (INIS-GB–586) **Requirements for the approval of dosimetry services under the Ionising Radiations Regulations 1985: Pt. 1: External radiations.** Health and Safety Executive, London (United Kingdom). 1991. 15p. Order Number DE94620887. Source: OSTI; NTIS (US Sales Only); INIS.

Guidance for dosimetry services on the requirements for approval by the Health and Safety Executive (HSE) is provided in three parts. This part sets out the procedures and criteria that will be used by HSE in the assessment of dosimetry services seeking approval in relation to external radiations (including accidents). (author).

13266 (INIS-GB–587) **Requirements for the approval of dosimetry services under the Ionising Radiations Regulations 1985: Pt. 2: Internal radiations.** Health and Safety Executive, London (United Kingdom). 1991. 14p. Order Number DE94620888. Source: OSTI; NTIS (US Sales Only); INIS.

Guidance for dosimetry services on the requirements for approval by the Health and Safety Executive (HSE) is provided in three parts. This part sets out the procedures and criteria that will be used by HSE in the assessment of dosimetry services seeking approval in relation to internal radiations (including radon decay products). (author).

13267 (INIS-GB–588) **Requirements for the approval of dosimetry services under the Ionising Radiations Regulations 1985: Pt. 3: Coordination and record-keeping.** Health and Safety Executive, London (United Kingdom). 1991. 18p. Order Number DE94620889. Source: OSTI; NTIS (US Sales Only); INIS.

Guidance for dosimetry services on the requirements for approval by the Health and Safety Executive (HSE) is provided in three parts. This part sets out the procedures and criteria that will be used by HSE in the assessment of dosimetry services seeking approval for coordination and record keeping. (author).

13268 (INIS-GB–589) **Nuclear Industry Family Study.** AEA Technology, Harwell (United Kingdom). 17 Nov 1993. 5p. Order Number DE94619247. Source: OSTI; NTIS (US Sales Only); INIS.

This is a copy of the U.K.A.E.A. Question and Answer brief concerning an epidemiological study entitled the Nuclear Industry Family Study, to investigate the health of children of AEA, AWE, and BNFL Workers. The study is being carried out by an independent team of medical research workers from the London School of Hygiene and Tropical Medicine, and the Imperial Cancer Research Fund. (UK).

13269 (INIS-mf–13749, pp. 90) **Optical pattern recognition using neural network.** Zubairy, M.S. (Quad-i-Azam Univ., Islamabad (Pakistan). Dept.of Electronics); Rizvi, A.A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEURAL NETWORKS/lasers; NEURAL NETWORKS/pattern recognition; FUZZY LOGIC; IMPLEMENTATION; LASERS

13270 (INIS-mf–13775) **Pharmacokinetics of 125-I-labelled meta-Iodo-benzyl-guanidine : Preliminary results.** Mansouri, A. (Centre de Developpement des Techniques Nucleaires, Lab. des Radiopharmaceutiques, Algiers (Algeria)); Benhidour, A. Secretariat d'Etat a la Recherche, Algiers (Algeria). [1993]. 13p. Order Number DE94615903. Source: OSTI; NTIS (US Sales Only); INIS.

The study of some pharmacokinetics providing the mechanism of uptake amd metabolism parameters for the 125-I-mIBG is described. NMRI mice are used for plasma binding study, the animals are killed by decapitation after intravenously (IV) injection of 125-I-mIBG. Wistar rats are used in urinary excretion study. After IV injection, animals are placed in metabolic cages to collect urine. For biodistribution, the rats are killed at different time intervals. The considered organs are removed. The radioactivity of all parameters was performed by gamma counter. The results show that the blood clearance is very high after several hours post injection and very high after 72 hours. Furthermore, we note a rapid excretion of radioactivity 24 hours post injection. However, we observe that 72 hours after injection, the radioactivity per gram of different organs was normalized according to the adrenal glands. Also, we note, that the adrenal glands may be the only target organs 48 hours post injection. These results confirm that 125-I-mIBG a high affinity for the adrenergic innervation organs (Adrenal glands, salivary glands, heart and spleen).

13271 (INIS-mf–13787) **Radiophotoluminescent dosimetric system for personal and overall radiation control.** Khristova,

M.G. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 6p. (In Bulgarian). (CONF-9305325–: 2. conference on metrology assurance of nuclear energy: from theory to practical applications, Varna (Bulgaria), 30 May - 1 jun 1993). Order Number DE94617893. Source: OSTI; NTIS (US Sales Only); INIS.

An experimental RPL-SC dosimetric system for measurement of absorbed doses in persons exposed to mixed gamma- and neutron field over 1 mGy has been created. The measuring principle is based on the radiophotoluminescence (RPL) and on the impact of fast neutrons on Si semiconductor diodes. RPL-SC experimental model is composed of a computerized measuring system and a personal dosimetric cassette accommodating RPL and SC detectors. In the manual mode of the system each step of the manipulator and the corresponding detector measurements are set up by the operator who changes the range in cases of overload and registers the results. When automatic mode is used, the processes of backing up the supplying and controlling of electrical circuits, the manipulator controlling, measuring, registering and data processing are entirely controlled by a specially developed programme. Main characteristics: (1) Absorbed dose range: gamma-rays - 10^{-3} - 10^{2} Gy (10^{-1}- 104 rad); thermal neutrons - 10^{-3} - 10^{2} Gy (10^{-1}- 10^{4} rad); fast neutrons -10^{-3} - 30 Gy (10^{-1}- 3.10^{3} rad). (2) Irradiation energy: gamma-rays - 0.04 - 1.25 MeV; thermal neutrons - 0.024 eV; fast neutrons - 0.3 - 14 MeV. (3) Relative measurement error - 15%. (4) Recurrent measurement of one and the same dose. (5) Measurement time of 1 detector - 15 sec. Three measurement versions could be implemented: for RPL detectors, for SC detectors and for RPL detectors with a lower measuring range up to 2 cGy. (author).

13272 (INIS-mf–13822) **Changes in occupational exposure of Bulgarian citizens working with radiation sources in the period 1980 - 1991. Current level and future trends.** Karadzhov, A.; Velikov, V. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 9p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617894. Source: OSTI; NTIS (US Sales Only); INIS.

The study is based on data from the Central System for Individual and Dosimetric Control for the period 1980 - 1991. The centralized control is accomplished by film- and thermoluminescent dosemeters and embraces about 800 persons. The average annual equivalent doses for medical workers are in the range 0.6 - 0.9 mSv/y, and for the industry - in the range 1.3 - 3.1 mSv/y. The irradiation of gamma-defectoscopists and radiation internists is relatively higher. The forecasted values for occupational irradiation of the persons started working in irradiation environment after 1971 are in the range 30 - 100 mSv. Higher values (about 300 mSv) are predicted for the medical personnel working in gamma defectoscopy and curie-therapy. 4 refs., 3 tabs., 3 figs. (A.B.).

13273 (INIS-mf–13824) **The Chernobyl accident impact in Bulgaria - a review.** Bajrakova, A.; Vasilev, G. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 6p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617853. Source: OSTI; NTIS (US Sales Only); INIS.

A review is made of the papers presented at the Scientific Session of the National Centre for Radiobiology and Radiation protection (Sofia, BG) held in October 1992. They summarize the information about all possible consequences of the Chernobyl accident affecting the health of the Bulgarian population. The following topics are included: evaluation of radiation risk based on the radiation doses specified for the Bulgarian population including prenatal irradiation and inhalation of hot particles; analysis of oncological morbidity (general, of thyroid and of hemopoietic system); analysis of congenital malformations, registered in different hospitals during the first six years after the accident; directions for future epidemiologic studies; methodological and organizational problems in case of radiation accident. (A.B.).

13274 (INIS-mf–13825) **Health state of Bulgarians working in radiation environment.** Bliznakov, V. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 10p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617895. Source: OSTI; NTIS (US Sales Only); INIS.

The results from preliminary and periodical medical check-ups of about 27 000 persons are analysed. Special attention is paid to health condition of the uranium miners, the NPP-workers from the strictly controlled area and the gamma-spectroscopists. The most endangered group are the underground uranium miners which suffer most frequently. The health condition of the other groups as a whole is good. There are only isolated cases of occupational radiation injuries. The necessity to follow up the health shape of the irradiated persons through all their life span is pointed out. 1 tab., 5 figs. (A.B.).

13275 (INIS-mf–13826) **Atomic power engineering in Bulgaria and problems of emergency planning.** Kiradzhiev, G.; Khristova, M.; Shopov, N. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 12p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617881. Source: OSTI; NTIS (US Sales Only); INIS.

The decision making criteria for population protection in case of radiation accident accepted in Bulgaria are based on international standards of ICPR, IAEA and WHO. Some corrections within the proposed dose rates are made and the particular endangered population groups are specified in more detail. The methodological and organizational problems in application of particular preventive measures in the earlier phase of the accident are discussed: hiding, respiratory tract protection, iodine prophylaxis, evacuation. 11 refs. (A.B.).

13276 (INIS-mf–13828) **State and perspectives of medical radiation control in the NPP.** Shopov, N.; Khristova, M.; Zlatanova, R.; Keslev, D. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 6p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617896. Source: OSTI; NTIS (US Sales Only); INIS.

The medical radiation control in Kozloduy NPP is organized in two levels: permanent (current) monthly control in the strictly controlled area and the NPP stage, and periodical control of working conditions, the personnel radiation burden and the technical equipment. The analysis show that the radiation conditions in the Kozloduy NPP are in the established permissible levels. The disturbances recorded are most often connected with an infringement of the rules for handling radioactive substances. For the period 1974 - 1991 a total of 204 persons have received radiation doses above the permissible annual individual dose of 50 mSv. The normal NPP operation does not influence environment and population in a detectable extent. (A.B.).

13277 (INIS-mf–13830) **Directions in epidemiological investigations of the Chernobyl accident consequences.** Bajrakova, A.; Chobanova, N.; Tsenova, T.; Khristova, M. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 4p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617854. Source: OSTI; NTIS (US Sales Only); INIS.

The after-Chernobyl irradiation doses of the Bulgarian population cause possible health consequences in the sphere of scholastic effects only. Different mental disturbances arise under certain conditions. There are plans for epidemiologic investigations of the kind 'case-control' which are aimed to clarify the role of the radiation factor (of medical, professional and Chernobyl origin) in the appearance of some neoplasms in hemopoietic system and thyroid. A selective analysis of the congenital malformations frequency is envisaged which will overcome the shortcomings of the current registration system. Screening study of children born in the end of 1986 is also under way which will detect possible disturbances in their cognitive functions. The specifying of individual radiation

doses in all studies is based on data received by survey and on information for radiation conditions in Bulgaria prior and after the Chernobyl accident. 2 refs. (A.B.).

13278 (INIS-mf–13831) **Genetic monitoring of persons subjected to increased impact of mutagenic and carcinogenic factors - prophylaxis of late effects.** Benova, D.; Bulanova, M.; Vyglenov, A.; Georgieva, I.; Khadzhidekova, V.; Ivanov, B.; Rupova, I.; Yagova, A.; Kusheva, R. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 5p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617897. Source: OSTI; NTIS (US Sales Only); INIS.

The genetic monitoring is carried out on workers of the Kozloduy NPP, children living near the uranium mines and the miners themselves, as well as of children from regions with proved nonradiative hazards. The frequency of the micronucleus of the chromosomal aberration and the sister chromatid exchanges in lymphocytes of periphery blood (cytokinesis-block method) have been used as indices. An increased frequency values are reported in some workers from the controlled area of the Kozloduy NPP having longer length of service. This does not correlate with the data from the physical dosimetry. The investigated children from the village of Yana have shown no deviations. 14 refs. (A.B.).

13279 (INIS-mf–13832) **Bioindication of radiation injury in Kozloduy NPP workers.** Vyglenov, A.; Bliznakov, V.; Dzhunova, Zh.; Karadzhov, A. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 11p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617855. Source: OSTI; NTIS (US Sales Only); INIS.

The micronucleus frequency in lymphocytes of periphery blood of 73 Kozloduy NPP workers is determined by cytokinesis-clock micronuclear test. The results are analyzed taking into account the spontaneous micronucleus frequency, the age, the length of service and the accumulated radiation dose. Practically healthy persons from different regions of the country and 20 persons from the Kozloduy NPP which have no additional occupational exposure have been investigated as controls. 25 refs., 2 tabs., 2 figs. (A.B.).

13280 (INIS-mf–13833) **Morbidity with temporary incapacity for work among the underground workers in the 'Rare Metals' firm (BG).** Ivanov, Z.; Todorov, A.; Strakhilova, T. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 9p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617856. Source: OSTI; NTIS (US Sales Only); INIS.

The analysis is based on 52910 primary hospital protocols for the period 1985 - 1990. The interim morbidity among the underground uranium miners is higher in frequency and severity than this of the miners and metallurgical workers from analogous nonuranium objects. The dominated frequency of respiratory system diseases, including chronic inflammations of bronchial epithelium, give grounds for planning of a purposeful medical-biological prophylaxis and rehabilitation of the gainfully employed as well as of those resigned. This is done in order to avoid possible late carcinogenic effects. 25 refs., 1 tab. (A.B.).

13281 (INIS-mf–13834) **Local radiation injuries of skin - prophylaxis and therapy.** Stefanova, D.; Georgieva, R.; Pandova, V. Meditsinska Akademiya, Sofia (Bulgaria). Nauchen Inst. po Rentgenologiya i Radiobiologiya. 1992. 4p. (In Bulgarian). (CONF-9211296–: National symposium on development and current problems of prophylaxis in Bulgaria, Lovech (Bulgaria), 26-28 Nov 1992). Order Number DE94617857. Source: OSTI; NTIS (US Sales Only); INIS.

The drug preparation 'Nucliderm-gel' (BG patent document No. 68170/1984) is a gel formation containing native polynucleotide complex from thymus gland as an active component. The preparation is licensed in 1989 for production and usage by the Bulgarian Medical Drugs Commission. It has been applied in 43 patients (a total of 122 input fields) with acute or delayed radiodermatitis developed as a side effect after radiotherapy. The clinical surveillance of the skin reactions (erythema, edema, erosion, ulcer, skin atrophy and rhagades) show that this new preparation is a good stimulator of the granulation and epithelization processes. The drug has also a pronounced antiphlogistic and antinecrotic ability. (A.B.).

13282 (IPEN-PUB–387) **Radiotoxicity and incorporation of methyl-tritiated-thymidine on preimplantation mouse embryo. In vitro fertilization and culture.** Kikuchi, O.K. (Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil)); Ohyama, H.; Yamada, T. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). Apr 1993. 14p. (In Portuguese). (CONF-9207143–: 4. general congress on nuclear energy, Rio de Janeiro (Brazil), 5-9 Jul 1992). Order Number DE94615904. Source: OSTI; NTIS (US Sales Only); INIS.

In the present work different concentrations of methyl-^{3} H-thymidine was added to the culture medium micro drops containing the mouse zygotes at pro nuclear stage and the embryos were cultured in vitro at 37^0 C in a humidified atmosphere with 5% of CO_2 for four days up to the expanded blastocyst stage, the established end point to calculate the L D_{50} lethal dose. The blastocyst formation rate decreased with increasing concentration of tritium in medium and a value of 2.4 X 10^3 Bq/ml for L D_{50} was obtained. The ^{3} H-Td R incorporation by the embryo during the preimplantation period was low at the beginning and increased quickly during the morula and the blastocyst development. (author).

13283 (KFK–5205) **Thyroid dose conversion factors under condition of iodine isotopes dispersion via the air pathway.** Papadopoulos, D.; Wicke, A.; Winter, M. Kernforschungszentrum Karlsruhe GmbH (Germany). Hauptabteilung Sicherheit. Jul 1993. 26p. (In German). Order Number DE94747545. Source: OSTI; NTIS (US Sales Only); INIS.

Due to its unique radioecological and biological behaviour, radioactive iodine is considered separately in the calculation of doses. When released through the stack, it may cause radiation exposure of the population via dispersion and deposition over all exposure pathways. However, the relevant exposure pathway in radiological terms is incoporation by inhalation and by ingestion. Therefore, in this paper the incorporation dose will be considered for the groups of the population, namely infants during the first year of their life and adults. The thyroid dose is obtained from dose factors multiplied by the incorporated activity. In many cases it is desirable to calculate the thyroid dose by multiplying the released activity by the dispersion factor and by a conversion factor. This report describes the calculation of the conversion factors for all iodine isotopes (I-120 m to I-135) and for emission levels up to 200 m and for source distances up to 10 km. It has been shown that for distances from the source of 300 m and more and for emission heights up to 100 m the conversion factors of the iodine isotops are independent of the source distance and the height of emission within an error band of ±15%. (orig.)

13284 (NIRS-M–93, pp. 52-59) **Assessing the accumulation of potentially toxic elements in plants.** Kuboi, Toru (Shizuoka Univ. (Japan). Faculty of Agriculture). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Regression and principal components analyses were applied to understand the accumulation characteristics of potentially toxic elements(PTEs) in plants. The relation between tissue(tc) to soil(sc) Cd concentrations can be expressed as; log(tc) = α' + β' log(sc). For another soil, the equation will change to; log(tc) = α' + β' log(sc'). Based on both equations, the relationship between sc' and sc becomes; log(sc') = $(\alpha-\alpha')/\beta'$ + (β/β')log(sc). The values of the intercept and slope can be used to evaluate the difference of Cd availability between two soils. The values of α and β were used to characterize Cd accumulation in various plants. Plant families were classified into 3 groups based on α values; (1) low accumulation, Leguminosae; (2) moderate accumulation, Gramineae, Liliaceae,

Cucurbitaceae and Umbelliferae; and (3) high accumulation, Chenopodiaceae, Cruciferae, Solanaceae and Compositae. Values of β also enabled to discriminate the families. Principal components analysis was applied to the contents of Li, Na, K, Rb, Cs, Mg, Ca, Sr, and Ba in leaf samples of 62 species. These elements except for Na could be classified into 2 groups with respect to their accumulation in leaves; the alkali metals and alkaline earth metals. Factors scores of 1st and 2nd components revealed three groups of plant species; alkaliphillic, alkaline earthphillic, and neutral. (author).

13285 (NIRS-M–93, pp. 80-88) **Transfer characteristics of organically bound tritium into plant and foodstuffs.** Inoue, Yoshikazu (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

From the significance, with respect to dose, of organically bound tritium (OBT) in diet, ratios (SAR) of the specific activity of OBT to that of tissue free water tritium (TFWT) were investigated for various kinds of foodstuffs. The ratio of Japanese rice and Chinese rice ranged between 0.6 and 0.8 proved that the specific activity of OBT becomes less than unity due to the isotope discrimination in the assimilation process under the steady state condition. The ratio of about unity was also demonstrated for various kinds of worldwide foodstuffs. Very high SAR values reported by Italian studies on food items are therefore discounted. The difference of residence time between OBT and TFWT in plant, and the influence of atmospheric HTO vapor on both TFWT and exchangeable OBT were observed and considered to be the major causes of the variation of SAR value of foodstuffs under the dynamic condition. (author).

13286 (NIRS-M–93, pp. 123-131) **Dietary intake of radionuclides and dose estimations for Japanese.** Shiraishi, Kunio (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

Knowledge of dietary mineral intakes is important not only from the nutritional and medical viewpoints but also radiological protection purposes. Recently new powerful methodology, inductively coupled plasma mass spectrometry (ICP-MS) is becoming a popular techniques for determining trace elements. ICP-MS offers most of the versatility in contrast to the conventional method (e.g., atomic absorption spectrometry, inductively coupled plasma atomic emission spectrometry, and radiation measurement including alpha spectrometry and neutron activation analysis). In this report, analytical methods of ^{232}Th, ^{238}U, and ^{226}Ra in total diet samples for Japanese were described. Furthermore, annual dose equivalent for Japanese were estimated. Diet samples for males were collected by duplicate portion studies and a market basket study. The samples for one duplicate portion study were collected from 31 locations in Japan in the summer and winter of 1981. The market basket study was conducted in the Mito area in 1989. After the diet samples were dry-ashed, an aliquot ash was used for analysis of each radionuclide. ^{232}Th and ^{238}U were determined by ICP-MS with internal standard, ^{210}Bi. ^{226}Ra was determined by alpha-spectrometry after chemical separations. It was found that the daily intake per person of ^{226}Ra, ^{232}Th, and ^{238}U were 25, 1.7, and 8.8 mBq, respectively. Incorporating the internal dose estimation system (IDES) with Japanese physical parameters and other parameters of ICRP 30, the annual effective dose equivalents were estimated as 4×10^{-6} Sv for ^{226}Ra, 4×10^{-7} Sv for ^{232}Th, and 3×10^{-7} Sv for ^{238}U. Other age groups were also estimated. (author).

13287 (NIRS-M–93, pp. 132-138) **Model for assessing alpha doses for a Reference Japanese Man.** Kawamura, Hisao (National Inst. of Radiological Sciences, Nakaminato, Ibaraki (Japan). Nakaminato Lab. Branch Office). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

In view of the development of the nuclear fuel cycle in this country, it is urgently important to establish dose assessment models and related human and environmental parameters for long-lived radionuclides. In the current program, intake and body content of actinides (Pu, Th, U) and related alpha-emitting nuclides (Ra and daughters) have been studied as well as physiological aspects of Reference Japanese Man as the basic model of man for dosimetry. The ultimate object is to examine applicability of the existing models particularly recommended by the ICRP for workers to members of the public. The result of an interlaboratory intercomparison of ^{239}Pu + ^{240}Pu determination including our result was published. Alpha-spectrometric determinations of ^{226}Ra in bone yielded repesentative bone concentration level in Tokyo and Ra-Ca O.R. (bone-diet) which appear consistent with the literature value for Sapporo and Kyoto by Ohno using a Rn emanation method. Specific effective energies for alpha radiation from ^{226}Ra and daughters were calculated using the ICRP dosimetric model for bone incorporating masses of source and target organs of Reference Japanese Man. Reference Japanese data including the adult, adolescent, child and infant of both sexes was extensively and intensively studied by Tanaka as part of the activities of the ICRP Task Group on Reference Man Revision. Normal data for the physical measurements, mass and dimension of internal organs and body surfaces and some of the body composition were analysed viewing the nutritional data in the Japanese population. Some of the above works are to be continued. (author).

13288 (NIRS-M–93, pp. 144-152) **Biokinetics and dose assessment of radionuclides in juveniles.** Nishimura, Yoshikazu (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

In the aftermath of the Chernobyl accident, it becomes evident that dose coefficients for members of the public are necessary. International Commission on Radiological Protection (ICRP) established a task group of Committee 2 charged with the assessment of dose coefficients as a function of an individual's age. However, little data is available on the biokinetics of radionuclides in juvenile and there is a need to develop age-dependent biokinetic models, such as for the gastrointestinal tract. The present paper reviewed an outline on characteristics of biokinetics of radionuclides in juvenile animals focusing on the previous experimental data. The following radionuclides are discussed: ^{54}Mn, ^{60}Co, ^{65}Zn, ^{75}Se, ^{106}Ru, ^{110m}Ag, ^{115m}Cd, ^{125}Sb, ^{137}Cs, ^{141}Ce, ^{203}Hg and ^{3}H. Generally, intestinal absorption and whole-body retention of radionuclides in juveniles were higher than that of adult. In the case of sucklings, it is very important to study how radionuclides are transferred through the placenta and milk. The transfer rate of radionuclides through the placenta and milk is dependent on the period of gestation at the time of dosing. The IDES(Internal Dose Estimation System) which is based on the ICRP model was used for dose calculation. We modified the IDES using the biokinetic data which was gained animal experiment. The IDES is flexible because the absorbed dose can be calculated by substituting arbitrary physical and physiological parameters and also substituting ingested dose coefficients not only for the ICRP Reference Man, but also for Japanese of 1 year old, 5 years old, 10 years old, 15 years old and the adult, respectively. (author).

13289 (NIRS-M–93, pp. 153-159) **Transfer of significant radionuclides to fetuses.** Matsusaka, Naonori (Iwate Univ., Morioka (Japan). Faculty of Agriculture). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

It is generally recognized that the embryo and fetus are more susceptible to radiation than adults; therefore, efforts have been made to establish the exposure limits of selected radionuclides to the embryo/fetus. Several biological factors, such as metabolisms of nuclides, placental transfer rate, changes in the concentration during the progress of gestation in the embryo/fetus, and deposition in the fetal structures, may be needed to estimate the absorbed doses to the embryo/fetus from the internally deposited radionuclides. Most of this data is usually obtained by using experimental animals due to the difficulty of obtaining such data from humans. In the report of PNL-7445 prepared by Sikov, et al., priority nuclides are classified into six categolies according to the placental transfer and biokinetic features. In the present manuscript, the data for the placental transfer of several selected radionuclides (^{137}Cs, ^{65}Zn, ^{106}Ru, ^{144}Ce, and actinides) are overviewed. In most cases, we encounter the broad patterns and factors influencing the placental transfer as follows: different animal species used, different ways of the pregnancy determination, different routes of nuclide administration, different chemical forms of administered nuclides, different period of observation after administration, a wide range of units employed for expressing the data, and so on. Therefore, it will be proposed to make a similar experimental design among scientists for obtaining information of comparative aspects of the placental transfer in experimental animals. (author).

13290 (NIRS-M–93, pp. 160-168) **Phantoms for calculations of absorbed organ dose.** Hongo, S. (National Inst. of Radiological Sciences, Chiba (Japan)); Yamaguchi, H.; Takeshita, H.; Iwai, S.; Iwai, K. National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

We have developed a computer code IDES (Internal Dose Estimation System). In this code, MIRD Transformation Method is used and/or photon simulation by Monte Carlo method is possible. We have studied Japanese phantoms in two procedures of mathematical phantom and 'symbol phantom'. Our mathematical phantoms realize their height and body weights but dose not hold some of organ weights, which were measured by TANAKA and KAWAMURA. The symbol phantom can solve this discrepancy and realize a realistic phantom, although it remains problems of authorization and normalization. Errors were estimated for internal dose calculations and it was pointed out that to use realistic organ weights and parameters of kinetics was important competitively to reduce uncertainty of the results. (author).

13291 (NIRS-M–93, pp. 169-175) **Estimation of internal dose from radiocesium and phantom.** Uchiyama, Masafumi (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

A complicated model describing the movement of a radionuclide in both the natural environment and socioeconomical systems is usually used to estimate the internal dose to the public in terms of collective dose, taking demographic data into account. The result can be certified for reliability in some compartments of the model. One of the compartments is the body burden. In the case of radiocesium, the individual body burden can be measured using a whole-body counter. The measurement must be calibrated with a phantom. The public is composed of individuals of various ages. Accordingly, the whole-body counter should be calibrated with a set of phantoms approximating individuals of different body sizes. A relationship between counting efficiency and body size was analyzed on ^{137}Cs incorporated into the whole body using a set of phantoms. Four sizes covering average Japanese physique from infant to adult male, were chosen to prepare an anthropomorphic phantom system. Some hollow containers which simulated body segments were made from polyvinyl chloride and assembled to use as the phantom. The distribution of ^{137}Cs in aquatic solution was homogeneous through the phantom. A whole-body counter at the National Institute of Radiological Sciences, which had two 8 x 4 inch NaI(Tl) detectors sandwiching the subject, were used at a rate of 5 cm per minute in a scanning mode. The measurements were carried out in an iron room. Relations were analyzed between counting efficiency and some anthropometric parameters. The best fit was given by a linear equation of both reciprocals of height in cm and weight in kg, with a correlation coefficient of 1.00. The result was comparing with that from another whole-body counter that used 8 detectors in a static mode. (author).

13292 (NIRS-M–93, pp. 176-191) **Estimation of collective effective dose equivalent from environmental radiation and radioactive materials in Japan: A preliminary study.** Maruyama, Takashi (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Mar 1993. (In Japanese). (CONF-921297–: 20. National Institute of Radiological Sciences seminar on environmental research, Chiba (Japan), 10-11 Dec 1992). In *Approach to the nuclear safety for environment and members of public: Ecological behavior, metabolism, dose evaluation of radionuclides.* 201p. Order Number DE94707693. Source: OSTI; NTIS; INIS.

The peaceful uses of nuclear power and radiations have been developed into a stage of practical applications for human life. Radiation causes harmful effects to human beings, although human beings receives a number of invaluable benefits from the nuclear energy and the uses of radiation. In order to examine the optimization of radiation protection in these practices, collective effective dose equivalent from environmental exposures due to natural and artificial radiations have been preliminarily evaluated using most recent data. The resultant collective doses were compared with those from medical and occupational exposures. It is noted that, in Japan, the collective effective dose from environmental radiation sources can be approximately same to that from medical exposure. (author).

13293 (NUREG/CR–5569-Rev.1) **Health Physics Positions Data Base: Revision 1.** Kerr, G.D. (Oak Ridge National Lab., TN (United States)); Borges, T.; Stafford, R.S.; Lu, P.Y.; Carter, D. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Oak Ridge National Lab., TN (United States). Feb 1994. 290p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12067-Rev.1). Source: OSTI; NTIS; INIS; GPO.

The Health Physics Positions (HPPOS) Data Base of the Nuclear Regulatory Commission (NRC) is a collection of NRC staff positions on a wide range of topics involving radiation protection (health physics). It consists of 328 documents in the form of letters, memoranda, and excerpts from technical reports. The HPPOS Data Base was developed by the NRC Headquarters and Regional Offices to help ensure uniformity in inspections, enforcement, and licensing actions. Staff members of the Oak Ridge National Laboratory (ORNL) have assisted the NRC staff in summarizing the documents during the preparation of this NUREG report. These summaries are also being made available as a "stand alone" software package for IBM and IBM-compatible personal computers. The software package for this report is called HPPOS Version 2.0. A variety of indexing schemes were used to increase the usefulness of the NUREG report and its associated software. The software package and the summaries in the report are written in the context of the "new" 10 CFR Part 20 (§§20.1001–20.2401). The purpose of this NUREG report is to allow interested individuals to familiarize themselves with the contents of the HPPOS Data Base

and with the basis of many NRC decisions and regulations. The HPPOS summaries and original documents are intended to serve as a source of information for radiation protection programs at nuclear research and power reactors, nuclear medicine, and other industries that either process or use nuclear materials.

13294 (PCCF-RI–93-08, pp. 10-11) **Nuclear fragmentation models and uncertainties in cosmic ray transport and radiobiology studies.** Cucinotta, F.A. (National Aeronautics and Space Administration, Hampton, VA (United States). Langley Research Center); Wilson, J.W.; Townsend, L.W.; Shinn, J.L. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The biological effects of relativistic nuclei are of interest because of their potential hazards to astronauts during spaceflight and for possible radiotherapy treatment for cancer patients. For the study of transport processes in radiobiology, track-structure models are required in order to consider the lateral extension of an ions track due to secondary electrons. These models are overviewed briefly. (R.P.) 10 refs.

13295 (PCCF-RI–93-08, pp. 44-46) **Problems of radiation in space.** Schimmerling, W. (Universities Space Research Association, Washington, DC (United States)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

For space exploration to proceed, adequate protection of crew members must be ensured in particular, against the hazards of ionizing radiation. The most important biological hazards associated with ionizing radiation particles are so-called 'late effects', occurring during the remaining life span of the individual after exposure. Major unresolved problems for human activities in space are identified, and a schematic description of the rationale for the overall approach to the space radiation research program goals is presented. (R.P.) 2 refs.; 4 figs.

13296 (PCCF-RI–93-08, pp. 49-50) **Risk from relativistic heavy ions on manned space missions.** Curtis, S.B. (Lawrence Berkeley Lab., CA (United States)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The risk from exposure to radiation posed to space travelers will come from two sources: the slowly varying but low intensity high-energy galactic cosmic rays and the more intense predominantly low-energy protons from large solar particle events. The most important risks are identified and evaluated. It is concluded that not all the human risks from galactic cosmic radiation have been identified yet. (R.P.).

13297 (PCCF-RI–93-08, pp. 51-52) **Plant development in space.** Gerald, P. (Paris-6 Univ., 75 (France)). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

When root is placed horizontally its tip curves in order to orient itself with respect to gravity. Curvature is due to differential growth in the upper and lower sides of the root. In microgravity, roots do not grow straight, and their elongation is less than on the 1 g centrifuge. Gravity is necessary for a normal growth of plant organs. In space, it should be necessary to subject plants to a low level of artificial gravity. (R.P.).

13298 (PCCF-RI–93-08, pp. 58-59) **Assessment of components of radiation action by relativistic nuclei.** Watt, D.E. (Saint Andrews Univ. (United Kingdom). Dept. of Physics); Storey, J. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In a previous work a model for the biological action of ionising radiations, for various end-points in mammalian cells, has been derived. Here, a simplified version of the model is applied to determine the proportion of inactivation damage attributable to fragmentation products produced by irradiation of mammalian cells by relativistic protons. The damage by fragmentation nuclei was assessed, using the model. (R.P.) 7 refs.

13299 (PCCF-RI–93-08, pp. 60-61) **Comparison between cross section of deuterons and protons for cell inactivation and mutation induction.** Belli, M. (Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica); Ianzini, F.; Tabocchini, M.A.; Cera, F.; Cherubini, R.; Haque, A.M.I.; Tiveron, P.; Moschini, G.; Sapora, O. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of extensive studies on inactivation and mutation induced by protons in V79 cells showing that protons are more effective than alpha-particles at the same LET for both end-points, the investigated range of LET was extended for charged particle with Z=1 overcoming the inherent limitation of the proton range in biological matter, by a systematic investigation with deuteron beams. The results for protons and deuterons were compared. (R.P.) 7 refs.; 2 figs.; 1 tab.

13300 (PCCF-RI–93-08, pp. 62-63) **Biological effects of ^{20}Ne ion irradiation on tumoral and healthy rodent cells.** Poncy, J.L. (CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France)); Dhilly, M.; Archimbaud, Y.; Bimbot, R.; Clapier, F.; Kubica, B.; Anne, R.; Tousset, G.; Herault, J.; Freemann, R. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The relative biological effects of ^{20}Ne ions (95 MeV/u) on tumoral and normal rodent cells were determined, in comparison with different kinds of gamma radiations (cobalt 60 and iridium 192) with variable energies. Cells were irradiated in vivo. The dose response curves are shown for survival of P77 cells irradiated with ^{20}Ne ions and γ-rays. The survival curves are analyzed. (R.P.) 1 fig.; 1 tab.

13301 (PCCF-RI–93-08, pp. 64-65) **Radiation response of human tumour cell lines to heavy charged particles.** Courdi, A. (Centre de Lutte Contre le Cancer Antoine Lacassagne, 06 - Nice (France)); Caldani, C.; Scholz, M. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In vitro studies on human tumour cell lines would contribute to the selection of tumour types most likely to benefit of the radiation therapy with heavy charged particles, and would help selecting the optimum particle and energy. Further, measuring cell inactivation using human cell lines is necessary for space and nuclear radiation safety. Preliminary investigations are reported. (R.P.) 5 refs.; 3 figs.; 1 tab.

13302 (PCCF-RI–93-08, pp. 66-67) **Chromosomal instability induced by heavy ions in human fibroblasts.** Sabatier, L. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Dept. de Pathologie et de Toxicologie Experimentales); Martins, B.; Ricoul,

M.; Dutrillaux, B. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

The cytogenetic study of normal human dermis fibroblasts irradiated with heavy ions showed the appearance of de novo chromosomal instability (around the 15th passage after irradiation). It was shown that this instability can be induced in normal human cells, for a wide range of high LET radiation; it is transmissible through many cell divisions and is mainly reflected by the emergence of dicentric chromosomes. The chromosomal instability does not occur at random but affects certain specific telomeric regions and leads to clonal chromosomal imbalance and rearrangement, as frequently observed in human solid tumour. (R.P.) 17 refs.

13303 (PCCF-RI–93-08, pp. 68-69) **Relative biological effectiveness of 65 MeV protons at beam entrance and at the spread-out bragg peak.** Courdi, A. (Centre de Documentation sur les Syntheses Cristallines de Montpellier, 34 (France)); Brassart, N.; Herault, J.; Chauvel, P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Melanoma cells CAL 4 were exposed to 65 MeV protons produced by the cyclotron Medicyc in Nice at two depths, using 2 mm or 20 mm perspex, and a half range modulator, corresponding respectively to the beam entrance and the SOBP. The aim was to find out if there is a difference in effect between the beam entrance and the SOBP. Survival was assessed by the in vitro colony method, and the linear-quadratic model was used to fit the experimental points. (R.P.) 5 refs.; 2 figs.

13304 (PNL-SA–21948) **Assessment of accidental intakes of uranyl acetylacetonate (UAA).** Fisher, D.R.; Briant, J.K. Pacific Northwest Lab., Richland, WA (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9309294–1: Workshop on intakes of radionuclides, Bath (United Kingdom), 13-17 Sep 1993). Order Number DE94004262. Source: OSTI; NTIS; INIS; GPO Dep.

Uranyl acetylacetonate (UAA) is an organic complex of uranium used for military applications as a chemical catalyst in high explosives. It is prepared from depleted uranium metal (in lots of 5 kg to 7 kg) by dissolution in nitric acid, neutralization, and complexation with 2,4-pentanedione; the precipitate is dissolved in benzene and recrystallized, dried, ground, and packaged. About six workers at a small chemical company were exposed over a period of time to UAA powders during routine preparation and packaging of the uranium catalyst. The dissolution characteristics of the inhaled material were unknown and could not be determined from the published scientific literature. A 1.05-g sample of UAA powder was obtained from the responsible regulatory authority for further study to determine its chemical composition, and for dissolution in simulated lung fluid. We found the solubility of UAA to be equivalent to a mixture of 52% ICRP class D and 48% ICRP class W material. The annual limit on intake and the derived air concentration for radiological protection were estimated from this result for airborne exposure to UAA. A recycling biokinetic model was used to estimate both material-specific variations in urinary excretion rates and lung retention with time after accidental intakes. This study provides new information for evaluating future exposures to UAA.

13305 (PNL-SA–22828) **Contamination surveys for release of material.** Durham, J.S. (Pacific Northwest Lab., Richland, WA (United States)); Gardner, D.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940211–4: 27. midyear topical meeting of the Health Physics Society: managing radioactive and mixed waste, Albany, NY (United States), 13-17 Feb 1994). Order Number DE94008044. Source: OSTI; NTIS; GPO Dep.

Before material that has been used within controlled areas at nuclear facilities can be released for either controlled or unconditional use, it must be evaluated for the presence of surface contamination. A new procedure for the release of material at the Hanford Site is described in this paper. Material evaluation, which includes determining the potential that the material is contaminated, is the first step in this procedure. Material that is not potentially contaminated may be released without an instrument survey. Two options exist for material that is potentially contaminated. A scan survey is used if contamination levels are likely to exceed surface contamination guideline values listed in US Department of Energy (DOE) Order 5400.5 (DOE 1990); if contamination above the guideline values is unlikely, a statistical survey can be used. The material release procedure enhances the existing methodology and allows more flexibility when evaluating material that is not likely to be contaminated. For material that is not likely to be contaminated, the statistical methodology will reduce the amount of time required to perform surveys. In addition, the material evaluation process described here will allow material that has not been exposed to contamination to be released unconditionally without a survey.

13306 (RERF-CR–1-92) **Correcting for catchment area nonresidency in studies based on tumor-registry data.** Sposto, R.; Preston, D.L. Radiation Effects Research Foundation, Hiroshima (Japan). May 1993. 19p. Order Number DE94748530. Source: OSTI; NTIS; INIS.

We discuss the effect of catchment area nonresidency on estimates of cancer incidence from a tumor-registry-based cohort study and demonstrate that a relatively simple correction is possible in the context of Poisson regression analysis if individual residency histories or the probabilities of residency are known. A comparison of a complete data maximum likelihood analysis with several Poisson regression analyses demonstrates the adequacy of the simple correction in a large simulated data set. We compare analyses of stomach-cancer incidence from the Radiation Effects Research Foundation tumor registry with and without the correction. We also discuss some implications of including cases identified only on the basis of death certificates. (author).

13307 (RERF-CR–2-91) **The influence of death-certificate errors on cancer mortality trends.** Ron, E.; Hoel, D.G.; Carter, R.L.; Mabuchi, Kiyohiko. Radiation Effects Research Foundation, Hiroshima (Japan). Jun 1993. 14p. Order Number DE94748532. Source: OSTI; NTIS; INIS.

Over the past few years, several reports have suggested a recent increase in cancer mortality based on death-certificate diagnoses. To explore the effect of death-certificate errors on temporal trends in cancer mortality rates, we analyzed the data from the Atomic Bomb Casualty Commission/Radiation Effects Research Foundation's autopsy program in Hiroshima and Nagasaki. This series includes 5886 autopsies conducted between 1961 and 1987. Our analyses were focused on lymphoma, cancer of the breast, neoplasms of the brain, multiple myeloma, and melanoma (172 cases, total) because of concern over reports of their increased mortality. These 172 autopsy cases were referred to as Cancers of Interest. A significant increase in detection rates was observed for these Cancers of Interest primarily due to a large rise in mortality between 1976 and 1987. For the remaining cancers excluding stomach and lung (defined as Other), the pattern was similar to that seen for Cancers of Interest, but the fluctuation over time was not statistically significant. Confirmation rates generally increased with time except for Cancers of Interest. As a measure of bias in mortality rates due to death-certification errors and as a method to quantify under- or overestimation of death-certificate-based mortality rates,an adjustment factor (confirmation rate divided by detection rate) was calculated. The higher the adjustment factor, the greater the need to compensate for underreporting. For Cancers of Interest the adjustment factor decreased dramatically over time, but it did not change significantly for Other cancers. When the adjustment factors for Cancers of Interest and Other were compared, a statistically significant difference was found. For Cancers of Interest, a significant interaction between type of cancer and period was seen. Our findings indicate that considerable care must be shown when interpreting temporal trends in cancer vital statistics. (author).

13308 (RERF-CR–2-92) **Application of generalized estimating equations to a study in vitro of radiation sensitivity.** Cologne, J.B.; Carter, R.L.; Fujita, Shoichiro; Ban, Sadayuki. Radiation Effects Research Foundation, Hiroshima (Japan). Aug 1993. 21p. Order Number DE94748650. Source: OSTI; NTIS; INIS.

We describes an application of the generalized estimating equation (GEE) method (Liang K-Y, Zeger SL: Longitudinal data analysis using generalized linear models. Biometrika 73:13-22, 1986) for regression analyses of correlated Poisson data. As an alternative to the use of an arbitrarily chosen working correlation matrix, we demonstrate the use of GEE with a reasonable model for the true covariance structure among repeated observations within individuals. We show that, under such a split-plot design with large clusters, the asymptotic relative efficiency of GEE with simple (independence or exchangeable) working correlation matrices is rather low. We also illustrate the use of GEE with an empirically estimated model for overdispersion in a large study of radiation sensitivity where cluster size is small and a simple working correlation structure is sufficient. We conclude by summarizing issues and needs for further work concerning efficiency of the GEE parameter estimates in practice. (author).

13309 (RERF-TR–1-92) **Adult health study report 7. noncancer disease incidence in the atomic-bomb survivors, 1958-86 (examination cycles 1-14).** Wong, Flennie; Yamada, Michiko; Sasaki, Hideo; Kodama, Kazunori; Akiba, Suminori; Shimaoka, Katsutaro; Hosoda, Yutaka. Radiation Effects Research Foundation, Hiroshima (Japan). Aug 1993. 34p. Order Number DE94748651. Source: OSTI; NTIS; INIS.

Using the longitudinal data of the Adult Health Study (AHS) cohort collected during 1958-86, we examined for the first time the relationship between exposure to ionizing radiation and the incidence of 19 selected nonmalignant disorders. Diagnoses of the diseases were based on general laboratory tests, physical examinations, and histories taken during the biennial AHS examinations. The outcomes were encoded as three-digit International Classification of Diseases codes in the AHS data base, which served as the basis for case ascertainment. Statistically significant excess risk was detected for myoma uteri, chronic hepatitis and liver cirrhosis, and thyroid disease, defined broadly as the presence of one or more of certain noncancerous thyroid conditions. The finding for myoma uteri might be additional evidence indicating that benign tumor growths are possible effects of radiation exposure. An age-at-exposure effect was detected in nonmalignant thyroid disease, with increased risk for those exposed at ages $\leq$ 20 yr, but not for older persons. Thus, the AHS data also suggest that the thyroid gland in young persons is more radiosensitive not only to the development of thyroid malignancies, as shown in the most recent LSS report on cancer incidence, but also possibly to the development of nonmalignant disorders. Our findings hold independent of the dose effects observed for thyroid malignancies. No significant dose-response relationships were detected in any of our cardiovascular disease endpoints. Our analysis also suggests that new occurrences of lens opacity during 1958-86 are not increased with radiation dose among the AHS participants. Our results emphasize the utility and importance of the AHS in searching for the effects of acute exposure to ionizing radiation in noncancer diseases. (J.P.N.).

13310 (RERF-TR–4-92) **Autoantibodies and immunoglobulins among atomic-bomb survivors.** Fujiwara, Saeko (and others); Carter, R.L.; Akiyama, Mitoshi. Radiation Effects Research Foundation, Hiroshima (Japan). Jun 1993. 17p. Order Number DE94748535. Source: OSTI; NTIS; INIS.

The purpose of this study was to determine if exposure to atomic-bomb radiation affects immune responsiveness, such as the occurrence of autoantibodies and levels of immunoglobulins. Rheumatoid factor, antinuclear antibody, antithyroglobulin antibody, anti-thyroid-microsomal antibody, and immunoglobulin levels (IgG, IgM, IgA, and IgE) were measured among 2061 Adult Health Study participants in Hiroshima and Nagasaki from December 1987 to November 1989. The prevalence and titers of rheumatoid factor increased in a statistically significant manner with increasing radiation dose. No radiation effect was found on the prevalence of antinuclear antibody, antithyroglobulin antibody, and anti-thyroid-microsomal antibody. A statistically significant relationship was also found between radiation exposure and the IgA level in females and the IgM levels in both sexes-both levels increased as radiation dose increased. However, the effects of radiation exposure were not large and accounted for less than 10% of the total variation in each measurement. Levels of IgG and IgE were not affected by radiation exposure. (author).

13311 (RERF-TR–9-91) **Differential effects of atomic bomb irradiation in inducing major leukemia types: Analyses of open-city cases including the Life Span Study cohort based upon updated diagnostic systems and the dosimetry system 1986(DS86).** Tomonaga, Masao (and others); Matsuo, Tatsuki; Carter, R.L. Radiation Effects Research Foundation, Hiroshima (Japan). May 1993. 42p. Order Number DE94748536. Source: OSTI; NTIS; INIS.

In this report we utilize data from the additional 517 cases from the leukemia registry together with the Life Span Study (LSS) cohort data to study the effects of atomic bomb irradiation on major leukemia types. The French-American-British classification and other improved diagnostic methods were used to reclassify cases into 21 categories, including new disease entities such as adult T-cell leukemia (ATL). These categories were then grouped into four major types for analysis: (1) acute lymphocytic leukemia (ALL), (2) acute myeloid leukemia (AML) including myelodysplastic syndromes (MDS), (3) chronic myeloid leukemia (CML), and (4) OTHER types including ATL. Analyses of radiation effects were based on the updated Dosimetry System 1986(DS86). Incidence rates of all four leukemia types increased with increasing exposure level. The effects of radiation were significantly greater on the incidence of ALL and CML than on that of AML and OTHER. In the two lowest dose categories (1-49 and 50-499 mGy), estimated incidence either remained constant or increased slightly as the population of survivors aged. In the two highest dose categories (500-1,499 and $\geq$ 1,500 mGy). Among unexposed persons, the estimated risk of CML in Nagasaki relative to Hiroshima was significantly less than that of AML, whereas that of OTHER types was significantly greater. The time to onset of ALL, AML, and CML declined with increasing dose. The rate of decline, however, was greater for ALL and CML than for AML. The resulting differences at high doses reflect shorter incubation times for atomic-bomb-induced ALL and CML than for AML. (J.P.N.).

13312 (RERF-TR–12-91) **Simple, rapid HLA-DQA1 genotyping using the polymerase chain reaction and analysis by single-strand conformation polymorphism and restriction-enzyme cleavage.** Hayashi, Tomonori; Seyama, Toshio; Ito, Takashi; Kusunoki, Yoichiro; Hirai, Yuko; Nakamura, Nori; Akiyama, Mitoshi. Radiation Effects Research Foundation, Hiroshima (Japan). Jun 1993. 10p. Order Number DE94748531. Source: OSTI; NTIS; INIS.

A simple and rapid method for identifying alleles at the human-leucocyte-antigen-DQA1 locus (HLA-DQA1 locus) is described. The polymorphic second exon of the HLA-DQA1 locus was amplified by the polymerase-chain-reaction method. The amplified DNA was then analyzed by the single-strand-conformation-polymorphism/restriction-enzyme-cleavage assay. Using this method, the eight known DQA1 alleles could be distinguished from each other. In this paper, this method is suggested for quick genotyping of DQA1 alleles, but this method should also be useful for detecting point mutations at various positions in a fragment as well as new HLA-DQA1 genotypes. (author).

13313 (RERF-TR–15-91) **Combining diagnostic categories to improve agreement between death certificate and autopsy classifications of cause of death for atomic bomb survivors, 1950-87.** Carter, R.L.; Ron, E.; Mabuchi, Kiyohiko. Radiation Effects Research Foundation, Hiroshima (Japan). May 1993. 24p. Order Number DE94748529. Source: OSTI; NTIS; INIS.

Several investigators have observed less-than-desirable agreement between death certificate diagnoses and autopsy diagnoses for most specific causes of death, and even for some causes grouped by major disease category. Our results from data on 5130 autopsies of members of the Life Span Study cohort of atomic bomb survivors in Hiroshima and Nagasaki conducted prior to September 1987 were equally discouraging. Among diseases with more than 10 cases observed, confirmation rates ranged from 13

% to 97 % and detection rates from 6 % to 90 %. Both rates were greater than 70 % for only 6 of 60 disease categories studied and for only 1 of 16 categories defined by major International Classification of Disease categories (neoplasms). This deficiency suggests cautious interpretation of results from studies based on death certificate diagnoses. To determine whether any groupings of diagnoses might meet acceptable accuracy requirements, we applied a hierarchical clustering method to data from these 5130 cohort members. The resulting classification system had 10 categories: breast cancer; other female cancers; cancers of the digestive organs; cancer of the larynx; leukemia; nasal, ear, or sinus cancer; tongue cancer; external causes; vascular disease; and all other causes. Confirmation and detection rates for each of these categories were at least 66 %. Although the categories are broad, particularly for nonneoplastic diseases, further divisions led to unacceptable accuracy rates for some of the resulting diagnostic groups. Using the derived classification system, there was 72 % agreement overall between death certificate and autopsy diagnoses compared to 53 % agreement for a second system obtained by grouping strictly by major disease category. Eighty-seven percent agreement was observed for a similar classification system with vascular disease grouped with all other nonneoplastic diseases. Further agglomeration achieved very little additional improvement. (J.P.N.).

13314 (RERF-TR–18-91) **Radiation-related ophthalmologic changes and aging among the atomic bomb survivors: A reanalysis.** Otake, Masanori; Finch, S.C.; Choshi, Kanji; Takaku, Isao; Mishima, Hiromu; Takase, Tomoko. Radiation Effects Research Foundation, Hiroshima (Japan). May 1993. 24p. Order Number DE94748533. Source: OSTI; NTIS; INIS.

The relationship of ionizing radiation to the age-related ophthalmologic findings of the 1978-80 ophthalmologic examination of the atomic bomb (A-bomb) survivors of Hiroshima and Nagasaki has been reanalyzed using Dosimetry System 1986 eye organ dose estimates. The main purpose of this re-evaluation was to determine whether age and radiation exposure have an additive, synergistic, or antagonistic effect on ophthalmologic changes. The best model fitting axial opacities gives a significant positive effect for both linear dose-response and linear age-related regression coefficients and a significant negative effect for an interaction between radiation dose and age. Such a negative interaction implies an antagonistic effect in that the relative risks with relation to radiation doses decrease with increasing age. This phenomenon suggests that the lenses of younger persons are more sensitive to radiation than are those of older persons. However, the best-fitting relationship for posterior subcapsular changes suggested a linear-quadratic dose response and linear age-related effects. The quadratic estimate of radiation dose squared showed a highly significant effect with a negative trend, but the negative quadratic estimate was so extremely small it had almost no contributive value within an appropriative dose area. These data suggest an additive relationship between aging and radiation for the induction of posterior subcapsular changes, and they also indicate that there is no distinct evidence of a radiation-induced aging effect. The radiation-related relative risks increase with a log linearity. The decrease of visual acuity and accommodation with increasing age were comparable in both exposed and control subjects, with age-related visual acuity decreasing more than accommodation. (J.P.N.).

13315 (RISO-HOT-DECOM-P–6) **Decommissioning of the Risoe Hot Cell facility: 6. Periodic report covering January 1 to June 30, 1993.** Carlsen, H. Risoe National Lab., Roskilde (Denmark). Materials Dept. Oct 1993. 12p. Order Number DE94615976. Source: OSTI; NTIS; INIS.

A concise description of the current status of the decommissioning of the hot cell capacity at Risoe National Laboratory is given in this 6th periodic report covering January 1st to June 30th, 1993. All registered and safeguarded fissile material has been removed and the task of cutting and packing scrap material and experimental equipment from the concrete cell line has been completed. Concrete cells 5 and 6 have been finally cleaned and the master slave manipulators removed from them. The major part of the contamination on the shutters and shutter houses were on their horizontal planes and the main contaminant was ^{137}Cs. Here the surfaces were cleaned by wiping with wet cloths. The method is described. Tables illustrating the resulting contamination levels are included, the density is now low on the shutters. The method of final inn-cell cleaning is explained, and here again tables represent the resulting contamination levels. The work on "hot spot" removal and remote cleaning by vacuuming continues on the remaining cells. A collective dose of ca. 16.3 man-mSv was ascribed to 18 persons in the first half of 1993, arising mainly from in-cell work and waste handling. To sum up, the main results from this period are successful removal of last waste from the cells, remote cleaning of cells 2 and 3, final condition for all shutters and shutter housings and final condition for cells 5 and 6. Tables illustrate measured dose rates in detail. (AB).

13316 (USTUR–0004-93-Vol.2) **Publications of the United States Transuranium and Uranium Registries, 1968–1993: Volume 2, Annual reports.** Kathren, R.L.; Hunacek, M.; Gervais, T. (comps.). Washington State Univ., Richland, WA (United States). Coll. of Pharmacy. [1993]. 694p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-92EH89181. Order Number DE94004396. Source: OSTI; NTIS; GPO Dep.

The United States Transuranium and Uranium Registries (USTUR) began with the establishment of the National Plutonium Registry in 1968. In 1970, the name was changed to the United States Transuranium Registry to reflect a broader concern with the entire spectrum of transuranium elements, and in 1978, a parallel but separate United States Uranium Registry was created to study the uranium decay series. With similar goals of understanding the biokinetics, dosimetry, and potential health effects of transuranic elements and uranium series based on actual human experience, the two registries were administratively joined in February 1992 when responsibility for the Registries was transferred to Washington State University. Although a number of publications resulted from the research activities of the Registries, no list or collection of publications had been maintained over the years. Accordingly, compilation and publication of a complete listing and collection of Registries publications for from the inception through July 1993 was undertaken to coincide with the silver anniversary of the Registries. Several problems immediately surfaced, not the least of which was the definition of what constituted a "Registries publication." Given the history of the Registries, and the split responsibility and funding for various phases of the work among several Department of Energy contractors and other organizations over the years, this proved to be a difficult task. This volume consists of annual and progress reports published by the Registries.

5603 Chemicals Metabolism and Toxicology

Refer also to citation(s) 11454, 11458, 11493, 11835, 11837, 11838, 11933, 12104, 12718, 13064, 13081, 13103, 13104, 13122

13317 (ETDE-IT–94-22) **Synergistic effects in mice of trichloroethylene and copper overload on pulmonary clara cells injury.** Giovanetti, A. (ENEA, Casaccia (Italy). Area Energia Ambiente e Salute); Massa, E.M.; Farias, R.N.; Winik, B.; Schlick, C. No corporate text available. 1992. 3p. (CONF-9209115–3: 10. European congress on electron microscopy, Granada (Spain), 7-11 Sep 1992). Order Number DE94752541. Source: OSTI; NTIS (US Sales Only).

Trichloroethylene (TCE), an organic solvent of worldwide use, is also emitted by autovehicles as a by-product of fuel combustion. Previous works have demonstrated that TCE, given by inhalation or by i.p. injection, induces a selective, dose-dependent damage to pulmonary non-ciliated Clara cells. TCE needs to be bioactivated in order to exert its toxic effect. Compounds altering the enzymes activity can therefore modulate TCE cytotoxicity. Copper (Cu) is an essential element and its concentration in serum is under homeostatic control; it is a cofactor for enzymes such as cytochrome oxidase. Humans are exposed to Cu by drinking water. In order to investigate whether a Cu overload enhances enzymes-mediated damage, Albin Swiss male mice were fed with a Cu-supplemented diet; afterwards, they were treated with TCE. Epithelial damage was quantified by counting the percentage of non ciliated vacuolated cells. Ultrastructural studies showed that vacuolations consisted in swelling of SER cisternae. It was postulated that, at

physiological levels, Cu protects against lipid peroxidation, while at higher dosages, it promotes free radical formation.

13318 (ETDE-IT–94-40) **Building materials and environmental quality.** Michelini, M. (ENEA, Casaccia (Italy). Area Energetica); Porfiri, M.T.; Piardi, S. No corporate text available. 1992. 6p. (In Italian). (CONF-9205399–1: International meeting on ventilation and air quality in school buildings, Rome (Italy), 28 May 1992). Order Number DE94752623. Source: OSTI; NTIS (US Sales Only).

With the aim of classifying the environmental quality of building materials so as to allow building designers to reduce indoor air pollution and environmental impacts to acceptable levels, two evaluation forms were prepared. The environmental quality data, covering the entire life cycles of different building materials, from fabrication out of raw materials to demolition and final disposal, is broken down into a type of check list which gives easily readable and comparable information regarding environmental impacts during building material life phases and health and comfort impacts on workers and users.

13319 (ISTISAN–92-39) **Polychlorinated-biophenyls, dibenzofurans and dibenzodioxins in industrial dielectric fluids.** De Felip, E. (Istituto Superiore di Sanita, Rome (Italy)); Di Domenico, A.; Iacovella, N.; Pazzaglia, R.; Turrio Baldassarri, L.; Volpi, F.; Menale, G.; Falleni, M.; Tomasino, A. No corporate text available. Dec 1992. 54p. (In Italian). Order Number DE94752598. Source: OSTI; NTIS (US Sales Only).

The aims of this paper are: to characterize dielectric fluids - polychlorobiphenyls (PCB's), polychlorodibenzofurans (PCDF's) and polychlorodibenzodioxins (PCDD's), used in industrial equipment in terms of service life, thermal stress phenomena, etc.; to determine, by means of extraction in Soxhlet, gas and liquid column chromatography, the scrape and wipe tests, concentration levels of these substances on contaminated surfaces following seeping or accidental leaks, etc.; and to compare the ratio of PCB's to PCDF's and PCDD's in dielectric fluids in the cases of normal operation and following accidents.

13320 (ITRI–140) **Inhalation Toxicology Research Institute: Annual report, October 1, 1992–September 30, 1993.** Nikula, K.J.; Belinsky, S.A.; Bradley, P.L. (eds.). Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. Nov 1993. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. Order Number DE94007458. Source: OSTI; NTIS; GPO Dep.

This annual report for the Inhalation Toxicology Research Institute for 1992-1993 consists of 60 individual reports prepared separately by investigators describing progress in their own projects. Most papers are 2-5 pages long.

13321 (KFK-PUG–11) **Impairment of the rat lung surfactant system by inhalation of nitrogen dioxide: example of an environmental oxidative agent.** Mueller, B. (Marburg Univ. (Germany). Poliklinik). Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Umwelt und Gesundheit (PUG). Jun 1993. 206p. (In German). Sponsored by Land Baden-Wuerttemberg, Stuttgart (Germany). Project Number PUG 85/007/1C; Project Number PUG 87/001/1C; Proj Order Number DE94752451. Source: OSTI; NTIS (US Sales Only).

The aim of the study was to analyse the lung surfactant system after exposure to nitrogen dioxide. For this purpose rats were exposed to nitrogen dioxide atmospheres of 0.8, 5 and 10 ppm. After exposure a bronchoalveolar lavage was performed and the structure and function of the surfactant components analysed. Additionally the components were analysed in the model of the isolated lung and the isolated type II pneumocytes. All components of the surfactant system were increased in their amount depending on concentration and duration of the exposure. On the level of the isolated type II pneumocytes an increased rate of phospholipid synthesis was found after NO_2-inhalation whereas the secretion activity was decreased. Because the number of type II cells were increased in NO_2-exposed lungs the increased amount of surfactant components are due to the elevated number of these cells. Exposure in vivo and in vitro of the surfactant-phospholipids and the surfactant-protein A (SP-A) showed for both components an impaired function. Especially for the SP-A, a modulator of the surfactant system, its lipid-protein aggregation, its secretion inhibition activity and its mannose-binding ability were reduced. Thus the study shows the impairment of the surfactant system after inhalation of nitrogen dioxide. (orig.). 30 figs., 23 tabs., 347 refs.

13322 (SAND–93-2150) **Toxicity evaluation and hazard review for Rigid Foam.** Archuleta, M.M.; Stocum, W.E. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007248. Source: OSTI; NTIS; GPO Dep.

Rigid Foam is a chemical delay foam used to completely encapsulate an object or to block access to an area. Prior studies have indicated that the final foam product is essentially non-toxic. The purpose of this study was to evaluate and summarize the current chemical and toxicological data available on the components of Rigid Foam and to update the information available on the toxicity of the final Rigid Foam product. Since the possibility exists for a partial deployment of Rigid Foam where only one of the components is released, this study also examined the toxicity of its chemical constituents. Rigid Foam is composed of an "A" and "B" Component. The "A" component is primarily a polymeric isocyanate and the "B" component is a mixture of polyols. In addition to the primary constituents, dichlorodifluoromethane and trichlorofluoromethane are present as blowing agents along with catalysts and silicone surfactants necessary for foaming. The pre-deployed "A" and "B" components are stored in separate vessels and are brought together in static mixing nozzles for dispersal. The results of this evaluation indicate that a completely deployed Rigid Foam under normal conditions is essentially non-toxic as determined previously. However, in the event of a partial deployment or deployment of an individual component directly at an unprotected individual, the degree of hazard is increased due to the toxic and corrosive nature of the individual constituents. The health hazard would depend on the properties of the material to which the person was exposed.

5604 Other Environmental Pollutant Effects

Refer also to citation(s) 13065

57 HEALTH AND SAFETY

Refer also to citation(s) 11835, 11836, 11837, 11838, 12711, 13192, 14247

13323 (CONF-931208–2) **Simulation of traffic flow during emergency evacuations: A microcomputer based modeling system.** Rathi, A.K.; Solanki, R.S. Oak Ridge National Lab., TN (United States). Sep 1993. 10p. Sponsored by USDOE, Washington, DC (United States);Federal Emergency Management Agency, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter simulation conference; Los Angeles, CA (United States); 12-15 Dec 1993. Order Number DE94001131. Source: OSTI; NTIS; GPO Dep.

Evacuation is one of the major and often preferred protective action options available for emergency management in times of threat to the general public. One of the key factors used in evaluating the effectiveness of evacuation as a protective action option is the estimate of time required for evacuation. The time required for evacuation is the time associated with clearing an area at risk to areas far enough away to be considered safe. Computer simulation models of traffic flow are used to estimate the time it takes to evacuate or "clear" an at-risk region by means of vehicular evacuation. This paper provides a brief description of the Oak Ridge Evacuation Modeling System (OREMS), a prototype under development at the Oak Ridge National Laboratory. OREMS consists of a set of computer programs and models which can be used to simulate traffic flow during regional population evacuations and to develop evacuation plans for different events and scenarios (e.g. good vs. bad weather and nighttime vs. daytime evacuations) for user-defined spatial boundaries.

13324 (DOE/ID–10447) **Department of Energy Construction Safety Reference Guide.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Sep 1993. 342p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008792. Source: OSTI; NTIS; GPO Dep.

DOE has adopted the Occupational Safety and Health Administration (OSHA) regulations Title 29 Code of Federal Regulations (CFR) 1926 "Safety and Health Regulations for Construction," and related parts of 29 CFR 1910, "Occupational Safety and Health Standards." This nonmandatory reference guide is based on these OSHA regulations and, where appropriate, incorporates additional standards, codes, directives, and work practices that are recognized and accepted by DOE and the construction industry. It covers excavation, scaffolding, electricity, fire, signs/barricades, cranes/hoists/conveyors, hand and power tools, concrete/masonry, stairways/ladders, welding/cutting, motor vehicles/mechanical equipment, demolition, materials, blasting, steel erection, etc.

13325 (DOE/ID–10500) **Department of Energy Hoisting and Rigging Manual.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Apr 1993. 331p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94008796. Source: OSTI; NTIS; GPO Dep.

The manual is intended as a reference document to be used by supervisors, line managers, safety personnel, equipment operators, and any other personnel responsible for safety of hoisting and rigging operations at DOE sites. The manual quotes verbatim or paraphrases the requirements of the Occupational Safety and Health Administration (OSHA) and the American National Standards Institute (ANSI). It was developed to emcompass, under one cover, hoisting and rigging requirements, codes, standards, and regulations. In doing so, it eliminates the need to maintain extensive (and often incomplete) libraries of hoisting and rigging standards throughout the DOE.

13326 (LBL–35037) **Large area glare sources and their effect on discomfort and visual performance at computer workstations.** Osterhaus, W.K.E. (Lawrence Berkeley Lab., CA (United States)); Bailey, I.L. Lawrence Berkeley Lab., CA (United States). May 1992. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9210421–2: Institute of Electrical and Electronic Engineers Industry Applications Society (IEEE-IAS) annual conference, Houston, TX (United States), 4-9 Oct 1992). Order Number DE94007034. Source: OSTI; NTIS; GPO Dep.

This paper studies the effects of a large area light source of variable but uniform luminance surrounding a video display terminal (VDT) on the perceived glare discomfort and visual performance of computer operators. A set of criteria was established for rating the discomfort from glare as either "intolerable," "disturbing," "noticeable," or "imperceptible". Source luminance adjustments by means of a variable transformer to match the subjective glare criteria, as well as ratings of preselected lighting conditions on a visual analog scale with the same criteria, were used to determine comfortable lighting conditions. Results from the experiment indicate that subjects reliably selected a preferred lighting condition at any time when asked to adjust the luminance to produce optimum visual comfort. There was considerable between-subject variation in the range of luminances over which the surround field was neither noticeably too dim nor noticeably too bright. Comfortable luminance ranges also varied with initial presentation luminances immediately preceding the adjustment. Subjects preferred higher luminances following high initial presentation luminances. Performance speed at a difficult letter-counting task suggests that visual performance was slightly impaired by the presence of glare discomfort. Counting errors also occurred slightly more frequently under higher surround source luminances. There was a tendency for subjects to become more susceptible to glare over the course of the experiment.

5701 Real Accidents

Refer also to citation(s) 12145, 12194, 12836, 13127, 13273, 13277

58 GEOSCIENCES

Refer also to citation(s) 11538, 11548, 11549, 11550, 11553, 11587, 11682, 11683, 11686, 11706, 11753, 11767, 11832, 11861, 11956, 11958, 12785, 13033, 13082, 13113

13327 (ANL/CMT/PP–72773) **Stable isotope variations in Banded Iron Formations.** Abrajano, T.A. Jr.; Holt, B.D. Argonne National Lab., IL (United States). 18 Mar 1991. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008475. Source: OSTI; NTIS; GPO Dep.

In spite of the significant amount of work already reported in the scientific literature, many aspects of the origin of Banded Iron Formations (BIF) remain enigmatic. The authors demonstrate that mineralogic microbanding in BIF is accompanied by autocorrelated isotopic microbanding of organic carbon and carbonate carbon and oxygen. They propose that these isotopic patterns formed as a result of episodic mixing of waters in the depositional environment of BIF.

13328 (ANL/ER/CP–80451) **Implementation of instruments and facilities at the SGP CART site.** Sisterson, D.L.; Wesely, M.L. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940373–1: 3. atmospheric radiation measurement (ARM) science team meeting, Norman, OK (United States), 1-5 Mar 1994). Order Number DE94006839. Source: OSTI; NTIS; GPO Dep.

This report discusses the installation of instruments and trailers at the southern Great Plains Clouds and Radiation Testbed site.

13329 (CONF-940353–3) **A "model" geophysics program.** Nyquist, J.E. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Symposium on the application of geophysics to environmental and engineering problems; Boston, MA (United States); 27-31 Mar 1994. Order Number DE94007415. Source: OSTI; NTIS; INIS; GPO Dep.

In 1993, I tested a radio-controlled airplane designed by Jim Walker of Brigham Young University for low-elevation aerial photography. Model-air photography retains most of the advantages of standard aerial photography — the photographs can be used to detect lineaments, to map roads and buildings, and to construct stereo pairs to measure topography — and it is far less expensive. Proven applications on the Oak Ridge Reservation include: updating older aerial records to document new construction; using repeated overflights of the same area to capture seasonal changes in vegetation and the effects of major storms; and detecting waste trench boundaries from the color and character of the overlying grass. Aerial photography is only one of many possible applications of radio-controlled aircraft. Currently, I am funded by the Department of Energy's Office of Technology Development to review the state of the art in microavionics, both military and civilian, to determine ways this emerging technology can be used for environmental site characterization. Being particularly interested in geophysical applications, I am also collaborating with electrical engineers at Oak Ridge National Laboratory to design a model plane that will carry a 3-component flux-gate magnetometer and a global positioning system, which I hope to test in the spring of 1994.

13330 (LA–12712-MS) **Variational elliptic solver for atmospheric applications.** Smolarkiewicz, P.K. (National Center for Atmospheric Research, Boulder, CO (United States)); Margolin, L.G. Los Alamos National Lab., NM (United States). Mar 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94007725. Source: OSTI; NTIS; GPO Dep.

We discuss a conjugate gradient type method – the conjugate residual – suitable for solving linear elliptic equations that result from discretization of complex atmospheric dynamical problems. Rotation and irregular boundaries typically lead to nonself-adjoint elliptic operators whose matrix representation on the grid is definite but not symmetric. On the other hand, most established methods for solving large sparse matrix equations depend on the symmetry

and definiteness of the matrix. Furthermore, the explicit construction of the matrix can be both difficult and computationally expensive. An attractive feature of conjugate gradient methods in general is that they do not require any knowledge of the matrix; and in particular, convergence of conjugate residual algorithms do not rely on symmetry for definite operators. We begin by reviewing some basic concepts of variational algorithms from the perspective of a physical analogy to the damped wave equation, which is a simple alternative to the traditional abstract framework of the Krylov subspace methods. We derive two conjugate residual schemes from variational principles, and prove that either definiteness or symmetry ensures their convergence. We discuss issues related to computational efficiency and illustrate our theoretical considerations with a test problem of the potential flow of a Boussinesq fluid flow past a steep, three-dimensional obstacle.

13331 (LBL–30043, pp. 19-32) **Geoscience technical support for nuclear waste geologic repositories.** Mangold, D.C.; Tsang, C.F. Lawrence Berkeley Lab., CA (United States). Dec 1990. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

The Geoscience Technical Support activities in the Geologic Repository Project (GRP) at LBL covered a range of reports and reviews in FY89, particularly reviews of Study Plans of the Yucca Mountain site and their associated Comment Resolution Workshops. LBL sought to be responsive and active in meeting DOE's need for geoscience technical support for nuclear waste repositories. In addition, in consultation with DOE/HQ, the authors investigated and presented DOE with well-considered scientific inputs to program directions and new areas of needed work. This included the development of a white paper and proposed work plan on preclosure monitoring and performance confirmation that grew out of a request made by DOE to LBL to consider such studies for a repository in the unsaturated zone. This year also saw the beginning of a quality assurance program for GRP.

13332 (LBL–30043, pp. 33-41) **Radionuclides in hydrothermal systems as indicators of repository conditions.** Wollenberg, H.A.; Flexser, S.; Smith, A.R. Lawrence Berkeley Lab., CA (United States). Dec 1990. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

Hydrothermal systems in tuffaceous and older sedimentary rocks contain evidence of the interaction of radionuclides in fluids with rock matrix minerals and with materials lining fractures, in settings somewhat analogous to the candidate repository site at Yucca Mountain, NV. Earlier studies encompassed the occurrences of U and Th in a "fossil" hydrothermal system in tuffaceous rock of the San Juan Mountains Volcanic Field, CO. More recent and ongoing studies examine active hydrothermal systems in calderas at Long Valley, CA and Valles, NM. At the Nevada Test Site, occurrences of U and Th in fractured and unfractured rhyolitic tuff that was heated to simulate the introduction of radioactive waste are also under investigation. Observations to date suggest that U is mobile in hydrothermal systems, but that localized reducing environments provided by Fe-rich minerals and/or carbonaceous materials concentrate U and thus attenuate its migration.

13333 (LBL–30043, pp. 64-79) **Flow channeling in a single fracture as a two-dimensional strongly heterogeneous permeable medium.** Tsang, Y.W.; Tsang, C.F. Lawrence Berkeley Lab., CA (United States). Dec 1990. DOE Contract AC03-76SF00098. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

Recent interest in the evaluation of contaminant transport in bedrock aquifers and in the performance assessment of geologic nuclear waste repositories has motivated many studies of fluid flow and tracer transport in fractured rocks. Until recently, numerical modeling of fluid flow in the fractured medium commonly makes the assumption that each fracture may be idealized as a pair of parallel plates separated by a constant distance which represents the aperture of the fracture. More recent theoretical work has taken into account that the aperture in a real rock fracture in fact takes on a range of values. Evidence that flow in fractures tends to coalesce in preferred paths has been found in the field. Current studies of flow channeling in a fracture as a result of the variable apertures may also be applicable to flow and transport in a strongly heterogenous porous medium. This report includes the methodology used to study the flow channelling and tracer transport in a single fracture consisting of variable apertures. Relevant parameters that control flow channeling are then identified and the relationship of results to the general problem of flow in a heterogenous porous medium are discussed.

13334 (LBL–30043, pp. 80-99) **Hydrologic characterization of faults and other potentially conductive geologic features in the unsaturated zone.** Javandel, I.; Shan, C. Lawrence Berkeley Lab., CA (United States). Dec 1990. DOE Contract AC03-76SF00098. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

The capability of characterizing near-vertical faults and other potentially highly conductive geologic features in the vicinity of a high-level-waste repository is of great importance in site characterization of underground waste-isolation projects. The possibility of using transient air pressure data at depth (resulting from surface barometric pressure fluctuations) for characterizing these features in the unsaturated zone are investigated. Analytical solutions for calculating the pressure response of such systems are presented. Solutions are given for two types of barometric pressure fluctuations, step function and sinusoidal.

13335 (LBL–30043, pp. 100-113) **Mass transport with chemical reactions in a varying thermal field.** Carnahan, C.L. Lawrence Berkeley Lab., CA (United States). Dec 1990. DOE Contract AC03-76SF00098. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

The work described here is part of a task to theoretically and numerically analyze effects of varying thermal fields on transport of radionuclides and ground water components in fracture filling materials in the near field at Yucca Mountain, and to numerically estimate the sensitivity of the effects to magnitudes of controlling parameters. A computer program, THCVP, simulates coupling between advective/diffusive solute transport and chemical reactions, coupling of the reactions to heat transport, and feedback from precipitation/dissolution reactions to fluid flow. A simple simulation of transport of dissolved silicic acid along a gradient of temperature shows how precipitation of quartz at low temperatures can drastically reduce advective transport of all solution components including trace contaminants.

13336 (LBL–30043, pp. 114-132) **Seismic characterization of fracture properties.** Myer, L.R.; Pyrak-Nolte, L.J.; Hopkins, D.; Cook, N.G.W. Lawrence Berkeley Lab., CA (United States). Dec 1990. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

A critical component of site characterization and performance assessment involves the demonstration that any fluid flow which might reach the accessible environment is within acceptable limits. Various methods of analyzing flow in fractured rocks have been proposed, but choice of an appropriate method and its application to a specific site probably requires some knowledge of the spacing and length (or density) of fractures, their orientation and their hydraulic conductivity. Some of this information will undoubtedly come from geologic mapping on surface and in excavations, as well as from boreholes, cores and laboratory tests. However, it will be necessary to detect and characterize fractures in the rock mass between these direct observations. The remote detection and characterization of fractures by geophysical methods is, therefore, of considerable interest in connection with geologic repositories. The purpose of this paper is to show that there is a relationship, both empirical and theoretical, between the measured seismic response, the mechanical stiffness of fractures and their hydraulic conductivity. Laboratory measurements of the mechanical stiffness, hydraulic conductivity and seismic properties of natural fractures are summarized. A theoretical model for the amplitude and group time delay

for compressional and shear waves transmitted across a single fracture is presented. Predictions based on this model are compared with laboratory measurements. Finally, the results for a single fracture are extended to multiple parallel fractures.

13337 (LBL–30043, pp. 133-147) **Application of geophysical methods for fracture characterization.** Lee, K.H.; Majer, E.L.; Morrison, H.F.; McEvilly, T.V. Lawrence Berkeley Lab., CA (United States). Dec 1990. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

One of the most crucial needs in the design and implementation of an underground waste isolation facility is a reliable method for the detection and characterization of fractures in zones away from boreholes or subsurface workings. Geophysical methods may represent a solution to this problem. If fractures represent anomalies in the elastic properties or conductive properties of the rocks, then the seismic and electrical techniques may be useful in detecting and characterizing fracture properties.

13338 (LBL–30043, pp. 148-183) **A mechanical model for repeated slip events along normal faults in the basin and range: Applications to Yucca Mountain, Nevada.** Kemeny, J.M. Lawrence Berkeley Lab., CA (United States). Dec 1990. DOE Contract AC03-76SF00098. In *Geotechnical support and topical studies for nuclear waste geologic repositories: Annual report, fiscal year 1989.* 186p. Order Number DE94003377. Source: OSTI; NTIS; INIS.

A mechanical model has been developed to calculate the effects of repeated slip events along pre-existing normal faults in the Basin and Range. The model calculates the aseismic and seismic deformation due to the propagation of slip along the normal fault, and the moment and energy release associated with seismic motion. Also, the model calculates regional stress changes associated with a slip event, from which changes in the level of the water table are estimated. The model is used to predict the effects of a slip event on normal faults in the vicinity of Yucca Mountain, Nevada, which is the proposed site for underground nuclear waste storage.

13339 (PNL-SA–23042) **A parameterization of cloud droplet nucleation.** Ghan, S.J. (Pacific Northwest Lab., Richland, WA (United States)); Chuang, C.C.; Penner, J.E. Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940115–31: 74. American Meteorological Society annual meeting, Nashville, TN (United States), 23-28 Jan 1994). Order Number DE94007469. Source: OSTI; NTIS; GPO Dep.

Droplet nucleation is a fundamental cloud process. The number of aerosols activated to form cloud droplets influences not only the number of aerosols scavenged by clouds but also the size of the cloud droplets. Cloud droplet size influences the cloud albedo and the conversion of cloud water to precipitation. Global aerosol models are presently being developed with the intention of coupling with global atmospheric circulation models to evaluate the influence of aerosols and aerosol-cloud interactions on climate. If these and other coupled models are to address issues of aerosol-interactions, the droplet nucleation process must be adequately represented. Ghan et al. have introduced a droplet nucleation parameterization for a single aerosol type that offers certain advantages over the popular Twomey parameterization. Here we describe the generalization of that parameterization to the case of multiple aerosol types, with estimation of aerosol mass as well as number activated.

13340 (PNL-SA–23047) **The artificial intelligence model output analyzer.** Strauss, K.D. (Pacific Northwest Lab., Sequim, WA (United States)). Pacific Northwest Lab., Richland, WA (United States). Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940115–28: 74. American Meteorological Society annual meeting, Nashville, TN (United States), 23-28 Jan 1994). Order Number DE94007488. Source: OSTI; NTIS; GPO Dep.

Short communication. OCEANIC CIRCULATION/computerized simulation; ARTIFICIAL INTELLIGENCE; EDDY CURRENTS; O CODES

13341 (UCRL-JC–115254) **Lessons learned by the DOE complex from recent earthquakes.** Eli, M.W. Lawrence Livermore National Lab., CA (United States). Jul 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310102–44: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE94007455. Source: OSTI; NTIS; GPO Dep.

Recent earthquake damage investigations at various industrial facilities have resulted in providing the DOE complex with reminders of practical lessons for structures, systems, and components (SSCs) involving: confinement of hazardous materials; continuous, safe operations; occupant safety; and protection of DOE investments and mission-dependent items. Recent assessments are summarized, showing examples of damage caused by the 1992 California Earthquakes (Cape Mendocino, Landers, and Big Bear) and the 1991 Costa Rica Earthquake (Valle de la Estrella). These lessons if applied along with the new DOE NPH Standards (1020–92 Series) can help assure that DOE facilities will meet the intent of the seismic requirements in the new DOE NPH Order 5480.28.

66 PHYSICS

Refer also to citation(s) 13029

6610 General Physics

13342 (INIS-mf–13780) **Abstracts of articles from Iran's Physics conference, 1372.** Mirzabeygi, J. (ed.). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

The following topics discussed in Iran's Physics Conference: Quantum Mechanics, Nuclear Engineering, Lasers, Plasma, Nuclear medicine, and Astronomy.

13343 (JINR-R–2-92-485) **On new theories of physical vacuum.** Barashenkov, V.S.; Yur'ev, M.Z. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1992. 17p. (In Russian). Order Number DE94616613. Source: OSTI; NTIS (US Sales Only); INIS.

The recently published papers and monographs by Akimov, Acjukowskij, Weinik, Gerlovich et al. containing the attemps to construct a new theory of elementary particles and physical vacuum by means of refusal from the known quantum and relativistic principles are discussed. 22 refs.

6611 Classical and Quantum Mechanics

13344 (ANL/PHY/CP–81870) **Nonlinearity as an origin of nonuniqueness in solution of Hartree's equation.** Amusia, M.Ya. (Argonne National Lab., IL (United States)); Ioffe, A.F. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931252–1: 1993 international symposium on nonlinear theory and its applications, Honolulu, HI (United States), 5-10 Dec 1993). Order Number DE94006538. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. HARTREE-FOCK METHOD/analytical solution; NONLINEAR PROBLEMS; WAVE FUNCTIONS; HAMILTONIANS

13345 (BONN-HE–93-28) **The tensor product of tensor operators over quantum algebras.** Scheunert, M. Bonn Univ. (Germany). Physikalisches Inst. Sep 1993. 12p. (CONF-9307168–: International symposium on generalized symmetries in physics, Clausthal (Germany), Jul 1993). Order Number DE94752370. Source: OSTI; NTIS (US Sales Only); INIS.

The covariant tensor product of tensor operators over quantum algebras is investigated. In particular, the multiplicative properties of these tensor products are derived. (orig.)

13346 (BONN-IR-93-68) **On the systematic construction of convergent perturbation series.** Schmidt, C. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Dec 1993. 69p. (In German). Order Number DE94747251. Source: OSTI; NTIS (US Sales Only); INIS.

Starting from the general decomposition of the many-body Hamiltonian parametrized by an operator Λwe derive the class of 'Λ-transformed' perturbation series. Aiming at practical applications we consider many-body perturbation theory of atoms and molecules in finite dimensional Hilbert spaces. Investigation of the analyticity properties of the eigenvalues and eigenstates of the Hamiltonian as functions of the coupling parameter defined by the particular decomposition of H allows for the construction of (minimal) Λoperators mapping an originally divergent series to a convergent one. There exists an operator Λ_{opt} leading to the exact results in first order. Further improvements of the above mentioned minimal Λoperators can be achieved by approximations of Λ_{opt} leading to fast convergent perturbation series. As the size of the remaining perturbation is given by the Λoperator chosen this method provides an a priori estimate of the convergence properties. (orig.)

13347 (CEA-CONF-11438) **The multivariable Alexander polynomial and modern knot theory.** Saleur, H. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique). CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 13p. (CONF-9106454--: Conference on Advanced Quantum Field Theory and Critical Phenomena, Como (Italy), 17-21 Jun 1991). Order Number DE94618357. Source: OSTI; NTIS (US Sales Only); INIS.

This note is a summary of several recent works (by the author and collaborators) that study the Conway Alexander link invariant in the light of quantum groups and topological quantum field theories. Their purpose is to understand connections between "modern" knot theory and more classical topological concepts. (author).

13348 (CEA-SPhT-91-179) **Multiplicative formulation of quantum mechanics: A new setting for semi-classical analysis.** Voros, A. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Leboeuf, P. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 17p. Order Number DE94618358. Source: OSTI; NTIS (US Sales Only); INIS.

A general semi-classical description for the eigenfunctions of the multidimensional Schroedinger operator cannot be based on the WKB method which is incompatible with classically ergodic behavior. An alternative, more general multiplicative parametrization of quantum wave functions is suggested, whereby the semi-classical behavior of eigenfunctions can be traced in the presence of classical ergodicity, in the form of diffusive patterns of phase-space zeros in the quantum wave functions. (author) 24 refs.; 4 figs.

13349 (CEA-SPhT-92-121) **On Kontsevich integrals.** Itzykson, C. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1992. 13p. (CONF-9206436--: 16. Johns Hopkins workshop on current problems in particle theory, Goeteborg (Sweden), 8-10 Jun 1992). Order Number DE94618359. Source: OSTI; NTIS (US Sales Only); INIS.

Some mathematical results are described on a remarkable application of matrix interaction due to Witten and Kontsevich, to study topological invariants. Some interesting properties of the Kontsevich integrals are identified. (K.A.) 4 refs.

13350 (DESY-93-057) **Quantum eigenstates of a strongly chaotic system and the scar phenomenon.** Aurich, R. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Steiner, F. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Apr 1993. 30p. Sponsored by Deutsche Forschungsgemeinschaft, Bonn (Germany). Contract DFG Ste 241/4-6. Order Number DE94752467. Source: OSTI; NTIS (US Sales Only); INIS.

The quantum eigenstates of a strongly chaotic system (hyperbolic octagon) are studied with special emphasis on the scar phenomenon. The dynamics of a localized wavepacket is discussed which travels along a short periodic orbit yielding a test for the scar model developed by Heller. The autocorrelation function C(t) and the smeared weighted spectral density $S_\tau(E)$ are in accordance with this model, but the conclusion that this implies the existence of scarred eigenstates is not confirmed. A random wavefunction model generates with the same probability intensity structures being localized near short periodic orbits as the wavefunctions obeying the Schroedinger equation. Although there are some eigenstates which are localized near a periodic orbit, the conclusion that their intensities differ significantly from the statistically expected ones cannot be drawn. Thus the scar phenomenon seems to be absent in the case of hyperbolic octagons. (orig.)

13351 (DESY-93-140) **On the path integral in imaginary Lobachevsky space.** Grosche, C. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1993. 17p. (In German). Order Number DE94751734. Source: OSTI; NTIS (US Sales Only); INIS.

The path integral on the single-sheeted hyperboloid, i.e. in D-dimensional imaginary Lobachevsky space, is evaluated. A potential problem which we call 'Kepler-problem', and the case of a constant magnetic field are also discussed. (orig.)

13352 (DOE/ER/40757-020) **Quantum dynamics in dual spaces.** Sudarshan, E.C.G. Texas Univ., Austin, TX (United States). Dept. of Physics. [1993]. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER40757. Order Number DE94008303. Source: OSTI; NTIS; INIS; GPO Dep.

Quantum mechanics gives us information about spectra of dynamical variables and transition rates including scattering cross sections. They can be exhibited as spectral information in analytically continued spaces and their duals. Quantum mechanics formulated in these generalized spaces is used to study scattering and time evolution. It is shown that the usual asymptotic condition is inadequate to deal with scattering of composite or unstable particles. Scattering theory needs amendment when the interacting system is not isospectral with the free Hamiltonian, and the amendment is formulated. Perturbation theory in generalized spaces is developed and used to study the deletion and augmentation of the spectrum of the Hamiltonian. A complete set of algebraically independent constants for an interacting system is obtained. The question of the breaking of time symmetry is discussed.

13353 (GANIL-P-93-13) **Quantum tunneling in the driven Lipkin N-body problem.** Kaminski, P. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)); Arvieu, R.; Ploszajczak, M. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 33p. Order Number DE94618360. Source: OSTI; NTIS (US Sales Only); INIS.

Quantum tunneling is investigated in the quantum and semiclassical limits using an exactly soluble, periodically driven Lipkin N-body model. The time-dependent driving changes the tunneling rate by orders of magnitude as compared to the unperturbed system, leading to its enhancement in a somewhat similar way as found recently in simple one-dimensional anharmonic oscillator model for one particle. Oscillatory and coherent tunneling of the N-particle wave-function between two degenerate Hartree-Fock minima is found when the initial wave-function is localized in one doublet of quasienergy states of different parity. The coherent suppression of tunneling is also found for specific parameters of the driving force. (author) 21 refs.; 7 figs.; 2 tabs.

13354 (GSI-93-31(prepr.)) **An algebraic approach to the inverse eigenvalue problem for a quantum system with a dynamical group.** Wang, S.J. (Lawrence Berkeley Lab., CA (United States)); Chu, S.Y. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 20p. Order Number DE94752360. Source: OSTI; NTIS (US Sales Only); INIS.

An algebraic approach to the inverse eigenvalue problem for a quantum system with a dynamical group is formulated for the first time. One dimensional problem is treated explicitly in detail for both the finite dimensional and infinite dimensional Hilbert spaces. For the finite dimensional Hilbert space, the su(2) algebraic representation is used; while for the infinite dimensional Hilbert space, the

Heisenberg-Weyl algebraic representation is employed. Fourier expansion technique is generalized to the generator space, which is suitable for analysis of irregular spectra. The polynormial operator basis is also used for complement, which is appropriate for analysis of some simple Hamiltonians. The proposed new approach is applied to solve the classical inverse Sturn-Liouville problem and to study the problems of quantum regular and irregular spectra. (orig.)

13355 (IHEP-TD–91-8) **E_8 level two RSOS model.** Sergeev, S.M. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1991. 11p. Order Number DE94618361. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Mod.Phys.Lett.A.

Some arguments for the choice of admissible matrix and Boltzmann weights for the face model are presented. The uniqueness of Boltzmann weights allows to hope, that the obtained solution of the Yang-Baxter equation corresponds to the E_8 level 2 RSOS model. 8 refs.

13356 (INIS-mf–13780, pp. 41) **Formulation of discrete-time quantum mechanics.** Khorrami, M. (Sharif Univ. of Technology, Tehran (Iran, Islamic Republic of) Dept. of Physics). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUANTUM MECHANICS; CLASSICAL MECHANICS; DIFFERENTIAL EQUATIONS; FEYNMAN METHOD; UNITARITY

13357 (INIS-mf–13780, pp. 42-43) **Quantum distribution functions and extended canonical transformations.** Nasiri-Ghidari, S. (Shiraz Univ., (Iran, Islamic Republic of) Dept. of Physics). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CANONICAL TRANSFORMATIONS/ distribution functions; HAMILTONIANS; PHASE SPACE

13358 (INP–1577/PH) **The relativistic invariant and the Galilean mass of bodies.** Kapuscik, E. (Institute of Nuclear Physics, Cracow (Poland)); Kempczynski, J.; Horzela, A. Institute of Nuclear Physics, Cracow (Poland). Feb 1992. 12p. Order Number DE94616615. Source: OSTI; NTIS (US Sales Only); INIS.

We generalize the concept of the Galilean mass to the relativistic case. In the case of inequality of Galilean and inertial masses we calculate the relativistic invariant being constant along the trajectory of the moving body. It enables us to define an invariant measure of inertia of bodies. 4 refs. (author).

13359 (INP–1578/PH) **Classical time machine.** Kapuscik, E. (Institute of Nuclear Physics, Cracow (Poland)); Kempczynski, J.; Horzela, A. Institute of Nuclear Physics, Cracow (Poland). Feb 1992. 8p. Order Number DE94616616. Source: OSTI; NTIS (US Sales Only); INIS.

Generalizing concepts of the Einstein radiolocation method and, as a consequence, special relativity transformation rules we get that the time flow in the moving system depends on the direction of motion. 3 refs. (author).

13360 (INP–1579/PH) **On discrete models of space-time.** Horzela, A. (Institute of Nuclear Physics, Cracow (Poland)); Kempczynski, J.; Kapuscik, E.; Uzes, Ch. Institute of Nuclear Physics, Cracow (Poland). Feb 1992. 10p. Order Number DE94616617. Source: OSTI; NTIS (US Sales Only); INIS.

Analyzing the Einstein radiolocation method we come to the conclusion that results of any measurement of space-time coordinates should be expressed in terms of rational numbers. We show that this property is Lorentz invariant and may be used in the construction of discrete models of space-time different from the models of the lattice type constructed in the process of discretization of continuous models. (author).

13361 (IPNO-TH–92-63) **Spectral quasi-degeneracies in one-dimensional quartic potentials.** Khuat-duy, D.; Leboeuf, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jul 1992. 16p. Order Number DE94618364. Source: OSTI; NTIS (US Sales Only); INIS.

One-dimensional asymmetric double-well potentials of degree four have the property that, at a fixed energy, the classical period is the same in both wells. It is shown that at the quantum level this property reflects in an alignment of the spectral quasi-degeneracies at certain values of the parameters controlling the form of the potential. Experimental applications of this property are discussed. (author) 7 refs.; 5 figs.

13362 (IPNO-TH–92-101) **Topological 2-dimensional quantum mechanics.** Dasnieres de Veigy, A.; Ouvry, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Dec 1992. 18p. Order Number DE94618362. Source: OSTI; NTIS (US Sales Only); INIS.

A Chern-Simons Lagrangian is defined for a system of planar particles topologically interacting at a distance. The anyon model appears as a particular case where all the particles are identical. Exact N-body eigenstates are proposed and a perturbative algorithm is set up. The case where some particles are fixed on a lattice, is discussed, and curved manifolds are considered. (author) 14 refs.

13363 (IPNO-TH–92-102) **Variational approach to multi-time correlation functions.** Balian, R. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Veneroni, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1992. 52p. Order Number DE94618363. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics, B (NL).

A variational method is proposed to evaluate the generating functional ϕ which gives the multi-time correlation functions in equilibrium and non-equilibrium statistical mechanics or field theories. Its definition, ϕ = ln(Tr D A), involves the density operator D describing the initial state and an operator A depending on the observables of interest (in the Heisenberg picture), on the associated time-dependent sources and on the initial time. The example of interacting fermions in many-body physics is worked out by restricting the trial objects to exponentials of single-particle operators. This leads to an extended mean-field approximation for the generating functional associated with any set of observables using the variational approximation. The result incorporates both the static and dynamic Hartree-Fock equations as well as the associated RPA equations. It is free of several inconsistencies occurring in the conventional mean-field approximations. (K.A.) 21 refs.; 1 fig.

13364 (ITF–92-10R) **Zero modes of the two-dimensional Dirac operator on a noncompact Riemann surface in an external magnetic field.** Mishchenko, A.V.; Sitenko, Yu.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 24p. (In Russian). Order Number DE94616618. Source: OSTI; NTIS (US Sales Only); INIS.

A generalization of the Aharonov-Cashier theorem to the case of a topologically finite orient able surface is proposed and the expression for the index in the space of square integrable functions is obtained. The restrictions on the space of admissible functions, which are due to the selfadjointness of the Dirac operator, are discussed and the expression for the index in the case a conformally finite orient able surface is obtained. (author). 18 refs.

13365 (ITP–93-5E) **Quantum mechanics and thermodynamics of particles with distance dependent statistics.** Mashkevich, S.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. Order Number DE94616620. Source: OSTI; NTIS (US Sales Only); INIS.

The general notion of distance dependent statistics in anyon-like systems is discussed. The two-body problem for such statistics is considered, The general formula for the second Virial coefficient is derived and it is shown that in the limiting cases it reproduces the know results for ideal anyons. (author). 21 refs.

13366 (ITP–93-29E) **Representations of the q-deformed algebras U_q (so_2,1) and U_q (so_3,1).** Gavrilik, O.M.; Klimyk, A.U. AN

Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 23p. Order Number DE94616619. Source: OSTI; NTIS (US Sales Only); INIS.

Representations of algebra U_q (so_2,1) are studied. This algebra is a q-deformation of the universal enveloping algebra U(so_2,1) of the Lie algebra of the group SO_0 (2,1) and differs from the quantum algebra U_q (SU_1,1). Classifications of irreducible representations and of infinitesimally irreducible representations of U_q (SU_1,1). The sets of irreducible representations and of infinitesimally unitary irreducible representations of the algebra U_q (so_3,1) are given. We also consider representations of U_q (so_n,1) which are of class 1 with respect to subalgebra U_q (so_n). (author). 22 refs.

13367 (IYaF–92-33) **Wick-Cutkovsky model: an introduction.** Silagadze, Z.K. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 74p. (In Russian). Order Number DE94618365. Source: OSTI; NTIS (US Sales Only); INIS.

Introduction in the Wick-Cutkovsky (WC) quantum model for a two-particle bound state is considered. The model corresponds to the interaction of two scalar particles through the scapar massless quantum exchange in the ladder approximation. The Bethe-Salpeter equation in the nonrelativistic theory and the Fock method for a two-dimensional hydrogen atom are considered. Problems of the stereographic projection in a general form and in the WC model are discussed. It is noted that the WC model has the SO(4) hidden symmetry for equal and inequal masses. 13 refs.

13368 (IYaF–93-12) **Functional integration method for the one-dimensional localization, the higher correlators and mean current in mesoscopic ring in the arbitrary magnetic field.** Kolokolov, I.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1993. 27p. (In Russian). Order Number DE94616621. Source: OSTI; NTIS (US Sales Only); INIS.

On the base of the Abrikosov problem on a particle in one-dimensional random potential are obtained closed representations for mean physical values in the form of functional integrals, which are calculated exactly without any expansions.

13369 (LYCEN–9234) **Introduction to quantum algebras.** Kibler, M.R. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Sep 1992. 24p. (CONF-9208251–: 2. international school of theoretica physics: symmetry and structural properties of condensed matter, Poznan (Poland), 26 Aug - 2 sep 1992). Order Number DE94618366. Source: OSTI; NTIS (US Sales Only); INIS.

The concept of a quantum algebra is made easy through the investigation of the prototype algebras $u_{qp}(2)$, $su_q(2)$ and $u_{qp}(1,1)$. The latter quantum algebras are introduced as deformations of the corresponding Lie algebras; this is achieved in a simple way by means of qp-bosons. The Hopf algebraic structure of $u_{qp}(2)$ is also discussed. The basic ingredients for the representation theory of $u_{qp}(2)$ are given. Finally, in connection with the quantum algebra $u_{qp}(2)$, the qp-analogues of the harmonic oscillator are discussed and of the (spherical and hyperbolical) angular momenta. (author) 50 refs.

13370 (LYCEN–9242) **Some aspects of q-boson calculus.** Smirnov, Yu.F.; Kibler, M.R. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Oct 1992. 14p. (CONF-9208164–: 6. symmetries in science, Bregenz (Austria), 2-7 Aug 1992). Order Number DE94618367. Source: OSTI; NTIS (US Sales Only); INIS.

The Jordan-Schwinger calculus is discussed, using deformed bosons. This work constitutes a first step toward a complete study of the $SU_q(2)$ unit tensor. The objective is to find a realization of the components of this tensor in terms of q-bosons. The q-deformed Schwinger algebra relative to $SU_q(2)$ is defined, and an algorithm for producing recurrent relations between Clebsch-Gordan coefficients for $SU_q(2)$ is given. (K.A.) 18 refs.

13371 (LYCEN–9324) **Q-analogue of the Krawtchouk and Meixner orthogonal polynomials.** Campigotto, C. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Smirnov, Yu.F.; Enikeev, S.G. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Jun 1993. 16p. (CONF-9310302–: 4. International symposium on orthogonal polynomials and their applications, Evian (France), 19-23 Oct 1993). Order Number DE94618368. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Computational and Applied Mathematics.

The comparative analysis of Krawtchouk polynomials on a uniform grid with Wigner D-functions for the SU(2) group is presented. As a result the partnership between corresponding properties of the polynomials and D-functions is established giving the group-theoretical interpretation of the Krawtchouk polynomials properties. In order to extend such an analysis on the quantum groups $SU_q(2)$ and $SU_q(1,1)$, q-analogues of Krawtchouk and Meixner polynomials of a discrete variable are studied. The total set of characteristics of these polynomials is calculated, including the orthogonality condition, normalization factor, recurrent relation, the explicit analytic expression, the Rodrigues formula, the difference derivative formula and various particular cases and values. (R.P.) 22 refs.; 2 tabs.

13372 (LYCEN–9327) **On a generalized Aharonov-Bohm plus oscillator system.** Kibler, M.; Campigotto, C. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Jun 1993. 14p. Order Number DE94618369. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters, (Section) A (NL).

Dynamical algebras, of the so(3,2) and so(3) types, are obtained for a generalized Aharonov-Bohm plus oscillator (ABO) system. Two types of coherent states are introduced for this generalized ABO system. A (q,p)-analogue of this system is proposed that reduces to the generalized ABO system in the limiting case $p=q^{-1}=1$. Finally, the classical motions for the generalized ABO system are briefly described. (author) 39 refs.

13373 (UWThPh–1993-16) **Local properties of Coulombic wave functions.** Hoffmann-Ostenhof, M. (Vienna Univ. (Austria). Inst. fuer Mathematik); Hoffmann-Ostenhof, T.; Stremnitzer, H. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 12 Jul 1993. 31p. (ESI–1993.). Order Number DE94618370. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the local behaviour of solutions of a nonrelativistic Schroedinger equation which describe Coulombic systems. Firstly we give a representation theorem for such solutions in the neighbourhood of Coulombic singularities generalizing previous results (Cusp conditions) due to Kato and others. Secondly we investigate the influence of Fermi statistics on the local behaviour of many fermionic wave functions, showing that e.g. and N-electron wave function must have zeros of order at least $N^{4/3}$ for large N. (authors). 18 refs.

6612 Techniques of General Use in Physics

Refer also to citation(s) 13839

13374 (ANL/APS/PP–69709) **Effect of the slit widths: Appendix A.** Argonne National Lab., IL (United States). [1990]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008115. Source: OSTI; NTIS; INIS; GPO Dep.

The aim of this mathematical treatment is to prove that any distortion of the gaussian intensity distribution of the beam, which may be caused by the finite width of the slits, is small, provided that the slit widths are not large with respect to the source size and divergence. The widths of the slit A and of the slit B were the same, equal to 0.1 mm for the measurement of the horizontal source size and divergence, and equal to 0.025 mm in the vertical case. It turns out, as shown below, that the distortion of the phase space gaussian beam distribution is estimated to be not greater than 6% in the vertical case and is considerably smaller in the horizontal case. The procedure followed in the analysis of the experimental data is then justified and is a good approximation.

13375 (BNL–49946) **Intense low energy positron beams.** Lynn, K.G.; Jacobsen, F.M. Brookhaven National Lab., Upton, NY (United States). [1993]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930715–1: Workshop on positron interactions with atoms, molecules and clusters, Bielefeld (Germany), 14-17 Jul 1993). Order Number DE94007167. Source: OSTI; NTIS; INIS; GPO Dep.

Intense positron beams are under development or being considered at several laboratories. Already today a few accelerator based high intensity, low brightness e^+ beams exist producing of the order of $10^8 - 10^9$ e^+/sec. Several laboratories are aiming at high intensity, high brightness e^+ beams with intensities greater than 10^9 e^+/sec and current densities of the order of $10^{13} - 10^{14}$ e^+ $sec^{-1}cm^{-2}$. Intense e^+ beams can be realized in two ways (or in a combination thereof) either through a development of more efficient B^+ moderators or by increasing the available activity of B^+ particles. In this review we shall mainly concentrate on the latter approach. In atomic physics the main trust for these developments is to be able to measure differential and high energy cross-sections in e^+ collisions with atoms and molecules. Within solid state physics high intensity, high brightness e^+ beams are in demand in areas such as the re-emission e^+ microscope, two dimensional angular correlation of annihilation radiation, low energy e^+ diffraction and other fields. Intense e^+ beams are also important for the development of positronium beams, as well as exotic experiments such as Bose condensation and Ps liquid studies.

13376 (BUDKERINP–92-88) **XAFS-like structure of resonant Raman scattering.** Chernov, V.A.; Mytnichenko, S.V.; Nikitenko, S.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 11p. Order Number DE94618410. Source: OSTI; NTIS (US Sales Only); INIS.

The KM-shell resonant Raman scattering from a nickel sample has been measured at an energy of incident X-ray photons, of about 120 eV below the K-edge. XAFS-like oscillations have been observed in the scattered spectrum for the first time. The observed spectrum is compared with the XAFS spectrum. The basic differences between these two methods are discussed. 12 refs.; 3 figs.

13377 (INIS-mf–13749, pp. 37) **Temporal structure of generation of argon laser at passive mode synchronization.** Nazarov, B.I. (S.U. Umarov Physico-Technical Inst. of Tadjik Academy of Sciences (Tajikistan)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER RADIATION/synchronization; SYNCHRONIZATION; PULSES; RESONATORS

13378 (INIS-mf–13749, pp. 38) **Technological laser unit to make holes.** Erofeev, E.A. (NPO Akadempribor Academy of Sciences of Uzbekistan, Tashkent Akademgorodok, (Uzbekistan)); Ganeev, R.A.; Gulamov, A.A.; Kamalov, Sh.R.; Redkorechev, V.I.; Usmanov, T. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER DRILLING/lasers; LASERS; LASER RADIATION; OPTIMIZATION

13379 (INIS-mf–13749, pp. 72) **Surface alloying of mild steel with high power laser.** Gupta, A. (Devi Alilya Univ., Indore (India). School of Physics); Purohit, S.; Nath, A.K. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STEELS/carbon dioxide lasers; STEELS/hardening; CHROMIUM; COATINGS; MELTING; MICROHARDNESS; MICROSTRUCTURE; NICKEL; SILICON; STEELS; HARDENING; SURFACE PROPERTIES; THIN FILMS; WEAR RESISTANCE

13380 (INIS-mf–13749, pp. 77) **The laser marker of cable items.** Papazyan, T.A. (NPO Laserayin Tekhnika, Erevan (Armenia)); Ishkhanyan, S.P.; Hoyhannisyan, M.K. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CABLES/laser radiation; CABLES; TAGGED PHOTON METHOD

13381 (INIS-mf–13749, pp. 86) **Laser induced spin polarized electron injectors.** Farkhondeh, M. (MIT-Bates Linear Accelerator Center, Middleton, MA (United States)). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (In Persian). (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 38-39.

Short communication. ELECTRON BEAM INJECTION/lasers; LASERS; ELECTRON BEAMS; ENERGY-LEVEL TRANSITIONS; GALLIUM ARSENIDES; PHOTOEMISSION; POLARIZATION; POLARIZED BEAMS

13382 (INIS-mf–13749, pp. 101) **Fabrication of plane phase diffraction gratings.** Mahmoodi-Lari, M.J. (Shiraz Univ., (Iran, Islamic Republic of). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 44.

Short communication. DIFFRACTION GRATINGS/holography; HOLOGRAPHY; EFFICIENCY; HELIUM-NEON LASERS

13383 (INIS-mf–13749, pp. 105) **A reliable and economic fast light source.** Vaezi-Nejad, S.M. (Greenwich Univ., London (United Kingdom). School of Engineering); Shams, I. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LIGHT SOURCES/design; ECONOMICS; DESIGN; PERFORMANCE; RELIABILITY

13384 (INIS-mf–13749, pp. 110) **Fabrication of diffraction gratings in As-S thin films.** Zakery, A. (Shiraz Univ., (Iran, Islamic Republic of). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 49.

Short communication. ARSENIC SULFIDES/diffraction gratings; RESOLUTION; THIN FILMS

13385 (INP–91-27) **Surface negative ion production in ion sources.** Bel'chenko, Yu.I. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1991. 38p. (IYaF–91-27.). Order Number DE94618411. Source: OSTI; NTIS (US Sales Only); INIS.

A surwey of the surface processes, which a relevant for Negative Ions (NI) production in the various surface-plasma sources (SPS) modifications and in the analogous 'volume' sources with the small adding of cesium is given. The efficiency of the NI production

on the cathode and anode gas-discharge surfaces, as well as on the surfaces of the specially-prepared emitters, contacted with gas-discharge plasma, is discussed. 66 refs.; 9 figs.

13386 (LA-SUB–93-227) **Research on foil transport of intense electron beams: Final report.** Humphries, S. Jr. (Univ. of New Mexico, Albuquerque, NM (United States). Dept. of Electrical and Computer Engineering). Los Alamos National Lab., NM (United States); New Mexico Univ., Albuquerque, NM (United States). Dept. of Electrical and Computer Engineering. [1987]. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94008098. Source: OSTI; NTIS; GPO Dep.

Tasks on LANL Contract No. 9-X66-W2078-1 were completed on December 31, 1987, ahead of schedule. Major experimental results are reported in the two publications attached as Appendix A and Appendix B. Another publication summarizing additional experiments is in preparation by C. Ekdahl of Los Alamos National Laboratory. A copy of the contract work statement is included as Appendix C.

13387 (LYCEN–9317) **First high energy hydrogen cluster beams: A new facility at IPN Lyon, France.** Gaillard, M.J. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Genre, R.; Hadinger, G.; Martin, J.; Schempp, A.; Deitinghoff, H.; Kipper, A.; Madlung, J.; Moser, H.O. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Mar 1993. 6p. (CONF-920921–: 6. international symposium on small particles and inorganic clusters, Chicago, IL (United States), 16-22 Sep 1992). Order Number DE94618412. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zeitschrift fuer Physik, D (Atoms, Molecules and Clusters) (DE).

The hydrogen cluster accelerator of the Institut de Physique Nucleaire de Lyon (IPN Lyon) has been upgraded by adding a Variable Energy Post-accelerator of RFQ type (VERFQ). This operation has been performed in the frame of a collaboration between KfK Karlsruhe, IAP Frankfurt and IPN Lyon. The facility has been designed to deliver beams of mass selected Hn^+ clusters, n chosen between 3 and 49, in the energy range 65-100 keV/u. For the first time, hydrogen clusters have been accelerated at energies as high as 2 MeV. This facility opens new fields for experiments which will greatly benefit from a velocity range never available until now for such exotic projectiles. (author) 13 refs.; 1 fig.

13388 (LYCEN–9318) **Interaction of fast H_n^+ with the last layers of carbon foils.** Farizon, M.; Faria, N.V.C. de; Mazuy-Farizon, B.; Gaillard, M.J. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Mar 1993. 3p. Order Number DE94618413. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Physics: Condensed Matter (GB).

A Monte Carlo program describing the penetration of H_n^+ hydrogen clusters in thin foils has been used to build a model of charge exchange for protons resulting from the breakup of these clusters. The total neutral fractions observed at emergence with cluster projectiles H_n^+, $n < 23$ in the energy range 40-120 keV/u, as well as the number of 2p excited states are well reproduced by these calculations taking into account geometrical structures of the projectiles and vicinity effects. (author) 8 refs.; 2 figs.

13389 (UCRL-JC–112646-Rev.1) **Emission from ferroelectric cathodes: Revision 1.** Sampayan, S.E.; Caporaso, G.J.; Holmes, C.L.; Lauer, E.J.; Prosnitz, D.; Trimble, D.O.; Westenskow, G.A. Lawrence Livermore National Lab., CA (United States). May 1993. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9305155–3-Rev.1: Workshop on high intensity electron sources, Legnaro (Italy), 24-28 May 1993). Order Number DE94006732. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have recently initiated an investigation of electron emission from ferroelectric cathodes. The experimental apparatus consisted of an electron diode and a 250 kV, 12 ohm, 70 ns pulsed high voltage power source. A planar triode modulator driven by a synthesized waveform generator initiates the polarization inversion and allows inversion pulse tailoring. The pulsed high voltage power source is capable of delivering two high voltage pulses within 50 μs of each other and is capable of operating at a sustained repetition rate of 5 Hz. The initial measurements indicate that emission current densities above the Child-Langmuir Space Charge Limit, J_{CL}, are possible. They explain this effect to be based on a non-zero initial energy of the emitted electrons. They also determined that this effect is strongly coupled to relative timing between the inversion pulse and application of the main anode-cathode pulse. They also have initiated brightness measurements of the emitted beam and estimate a preliminary lower bound to be on the order of 10^9 A/m^2-rad^2 for currents close to J_{CL} and factor of two less at currents over $4J_{CL}$. As in previous measurements at this Laboratory, they performed the measurement using a pepper pot technique. Beamlet profiles are recorded with a fast phosphor and gated cameras. They describe their apparatus and preliminary measurements.

6613 Other Aspects of Physical Science

Refer also to citation(s) 12176, 13021, 13489, 13928

13390 (CEA-CONF–11442) **Statistical mechanics on a 2D-random surface.** Duplantier, B. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 5p. (CONF-910838–: International conference on physics in two dimensions, Neuchatel (Switzerland), 19-23 Aug 1991; SPhT–91-161.). Order Number DE94618432. Source: OSTI; NTIS (US Sales Only); INIS.

Various geometrical models first defined in the Euclidean plane or on a regular lattice have been briefly reviewed, including self-avoiding walks, random walk intersections, percolation and Ising clusters. These systems embody infinite sets of field operators defined in a natural way from the (fractal) geometry of these fluctuating critical systems. Their scaling behavior can be linked to that of associated conformal field theories. These systems can also all be redefined on a random lattice or surface, instead of on a regular 2D lattice. They are then coupled to "quantum gravity", and live on the "world-sheet". The fact that all their new exponents on a random surface can then be related to those in the usual 2D-plane, although now well known in string theory, is worth publicizing in this Physics in 2D conference. We illustrate it by some exact solutions in the case of polymers and branched polymers (animals) on a random fluid surface. (author).

13391 (CEA-CONF–11450) **Exact results for the one dimensional asymmetric exclusion model.** Derrida, B. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Evans, M.R.; Pasquier, V.; Hakim, V. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1993. 9p. (CONF-9303265–: 4. Bar-Ilan Conference "Frontiers in Condensed Matter Physics", Bar-Ilan (Israel), 15-18 Mar 1993). Order Number DE94618433. Source: OSTI; NTIS (US Sales Only); INIS.

The asymmetric exclusion model describes a system of particles hopping in a preferred direction with hard core repulsion. These particles can be thought of as charged particles in a field, as steps of an interface, as cars in a queue. Several exact results concerning the steady state of this system have been obtained recently. The solution consists of representing the weights of the configurations in the steady state as products of non-commuting matrices. (author).

13392 (CEA-LLB–91-83) **Beyond the Born approximation. The case of very long polymer chains adsorbed at an interface.** Guiselin, O. (Laboratoire Leon Brillouin (LLB) - Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Jannink, G.; Cloizeaux, J. des. Laboratoire Leon Brillouin (LLB) - Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 1991. 16p. (CONF-9109525–: Symposium on polymer thermodynamics and radiation scattering, Strasbourg (France), 30 Sep - 1 oct 1991). Order Number DE94618434. Source: OSTI; NTIS (US Sales Only); INIS.

Two experimental evidences are discussed of the reflectance discontinuity associated with very long adsorbed polymer chains. It is shown that the Born approximation is not valid in this case. The anomalous low reflectivity is compared to the Ramsauer-Townsend effect in the scattering of slow electrons by rare-gas atoms. (author) 15 refs.; 6 figs.

13393 (CEA-R–5649) **Analysis of radioactive-matter interaction near thermodynamical equilibrium states.** Damamme, G. CEA Centre d'Etudes de Bruyeres-le-Chatel, 91 (France). 1993. 63p. (In French). Order Number DE94618435. Source: OSTI; NTIS (US Sales Only); INIS.

We study the absorption/emission process of photon by matter in the framework of a radiativo-collisionnal model of atom, a thermodynamical approach being used. The considered matter description is the atomic sphere one. First we give the expression of the balance equation around an equilibrium state. Then we express the atomic populations in function of the characteristics of the radiation and of the free electrons and of their time history. This permit us to interpret the photon balance as being due to true emission/absorption process of photons as well as fluorescence terms, all these processes being affected by relaxation effects. The total energy balance between matter and radiation can also be analyzed in the same way and conduct to introduce one photon effective interactions terms for each radiative proper mode, terms also affected by retardation effects. Such a taking into account of atom populations has no consequence on the radiative flux equation (i.e. the transfer opacity) but can considerably modify the energy balance between matter and radiation. (author). 11 refs., 3 figs.

13394 (DESY–93-043) **On the exact operator formalism of two-dimensional Liouville quantum gravity in Minkowski spacetime.** Kazama, Y. (Tokyo Univ. (Japan). Inst. of Physics); Nicolai, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Mar 1993. 26p. (UT-Komaba–93-6). Order Number DE94752471. Source: OSTI; NTIS (US Sales Only).

A detailed reexamination is made of the exact operator formalism of two-dimensional Liouville quantum gravity in Minkowski spacetime with the cosmological term fully taken into account. Making use of the canonical mapping from the interacting Liouville field into a free field, we focus on the problem of how the Liouville exponential operator should be properly defined. In particular, the condition of mutual locality among the exponential operators is carefully analyzed, and a new solution, which is neither smoothly connected nor relatively local to the existing solution, is found. Our analysis indicates that, in Minkowski spacetime, coupling gravity to matter with central charge $d<1$ is problematical. For $d=1$, our new solution appears to be the appropriate one; for this value of d, we demonstrate that the operator equation of motion is satisfied to all orders in the cosmological constant with a certain regularization. As an application of the formalism, an attempt is made to study how the basic generators of the ground ring get modified due to the inclusion of the cosmological term. Our investigation, although incomplete, suggests that in terms of the canonically mapped free field the ground ring is not modified. (orig.)

13395 (DESY–93-082) **N=2 super-Weyl symmetry, super-Liouville theory and super-Riemannian surfaces.** Ketov, S.V. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik); Moch, S.O. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 15p. (ITP-UH–18/93). Order Number DE94752407. Source: OSTI; NTIS (US Sales Only).

The finite form of the N=2 super-Weyl transformations in the chiral and twisted-chiral irreducible formulations of the two-dimensional N=2 superfield supergravity are found in N=2 superspace. The super-Weyl anomaly of the N=2 extended fermionic string theory is computed in terms of the N=2 superfields, by using a short time expansion of the N=2 chiral heat kernel. The super-Weyl invariant N=2 superconformal structure is introduced, and a new definition of the N=2 super-Riemannian surfaces is proposed. (orig.)

13396 (DOE/ER/40606–3) **Nuclear physics and astrophysics: Progress report for period June 15, 1992–June 14, 1993.** Schramm, D.N.; Olinto, A.V. Chicago Univ., IL (United States). Dept. of Astronomy and Astrophysics. Jun 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER40606. Order Number DE94007168. Source: OSTI; NTIS; INIS; GPO Dep.

The authors report on recent progress of research at the interface of nuclear physics and astrophysics. During the past year, the authors continued to work on Big Bang and stellar nucleosynthesis, the solar neutrino problem, the equation of state for dense matter, the quark-hadron phase transition, and the origin of gamma-ray bursts; and began studying the consequences of nuclear reaction rates in the presence of strong magnetic fields. They have shown that the primordial production of B and Be cannot explain recent detections of these elements in halo stars and have looked at spallation as the likely source of these elements. By looking at nucleosynthesis with inhomogeneous initial conditions, they concluded that the Universe must have been very smooth before nucleosynthesis. They have also constrained neutrino oscillations and primordial magnetic fields by Big Bang nucleosynthesis. On the solar neutrino problem, they have analyzed the implications of the SAGE and GALLEX experiments. They also showed that the presence of dibaryons in neutron stars depends weakly on uncertainties of nuclear equations of state. They have started to investigate the consequences of strong magnetic fields on nuclear reactions and implications for neutron star cooling and supernova nucleosynthesis.

13397 (GANIL-P–93-15) **Two-plasmon excitations in metallic clusters.** Catara, F. (Istituto Nazionale di Fisica Nucleare, Catania (Italy)); Chomaz, Ph.; Van Giai, N. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 28 Jun 1993. 17p. Order Number DE94618436. Source: OSTI; NTIS (US Sales Only); INIS.

A boson expansion method is used to study one- and two-boson states in metallic clusters. A jellium model and LDA energy density functional are the starting point for obtaining the basic bosons describing electron excitations. A boson mapping allows one to diagonalize the residual interaction between bosons. On the example of the Na_{21}^{+} cluster, it is found that strong anharmonic effects appear in the electronic excitation spectrum. (author) 21 refs.; 2 figs.; 3 tabs.

13398 (IC–93/343, pp. 30) **General crystal in prebiotic context.** Simon, I. (International Centre for Theoretical Physics, Trieste (Italy)). International Centre for Theoretical Physics, Trieste (Italy). Oct 1993. (CONF-9310280–: Conference on chemical evolution and the origin of life: self-organization of the macromolecules of life, Trieste (Italy), 25-29 Oct 1993). In *Conference on chemical evolution and the origin of life: Self-organization of the macromolecules of life: Summaries.* 32p. Order Number DE94617840. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PROTEINS/crystal-phase transformations; BIOLOGICAL EVOLUTION; CRYSTALLOGRAPHY; PROTEINS; RANDOMNESS

13399 (INIS-BR–3262) **Spin glass: thermal properties and characterization of the $\pm$ J Sherrington-Kirkpatrick model partition function zeros.** Faria, A.C. de. Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica. 1990. 119p. (In Portuguese). Order Number DE94618437. Source: OSTI; NTIS (US Sales Only); INIS.

A detailed study of the S-K model through the analysis of the zeros of the partition function in the complex temperature plane is performed. By the exact way, the notable thermodynamical properties of the system to a variety of the length ($N=5\rightarrow25$ spins) are calculated, using only standards concepts (without the use of tricks like that of replicas). Dilute models had been also considered. The principal result of this work is the characterization of the zeros of the partition function of the S-K model. (author).

13400 (INIS-BR–3267) **Evaluation of variational approximations.** Trevisan, L.A. Parana Univ., Curitiba, PR (Brazil). Curso de Pos-Graduacao em Fisica. 1991. 69p. (In Portuguese). Order Number DE94618438. Source: OSTI; NTIS (US Sales Only); INIS.

In Feynman's approach to quantum statistical mechanics, the partition function can e represented as a path integral. A recently proposed variation method of Feynman-Kleinert is able to transform the path integral into an integral in phase space, in which the quantum fluctuations have been taken care of by introducing the effective classical potential. This method has been testes with succeed for the smooth potentials and for the singular potential of delta. The method to the strong singular potentials is applied: a quadratic potential and a linear potential both with a rigid wall at the origin. By satisfying the condition that the density of the particle be vanish at the origin, and adapted method of Feynman-Kleinert in order to improve the method is introduced. (author).

13401 (INIS-mf–13749, pp. 59) **Degenerate four wave mixing in dye doped polymers.** Mohajerani, E. (Reading Univ., (United Kingdom). Dept. of Physics); Mitchell, G.R. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NONLINEAR OPTICS/polymers; DIFFRACTION GRATINGS; FREQUENCY MIXING; LASER RADIATION; POLYMERS; POLARIZATION

13402 (INIS-mf–13749, pp. 63) **Investigation of Te in S_2 crystals near phase transitions by method of second optical harmonic.** Ibragimov, T.D. (AN Azerbajdzhanskoj SSR, Baku (Azerbaijan). Inst. Fiziki). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. INDIUM SULFIDES/harmonic generation; TELLURIUM SULFIDES/harmonic generation; CRYSTALS; METAL VAPOR LASERS; NEODYMIUM LASERS; SIGNALS

13403 (INIS-mf–13749, pp. 64) **Optimization of four-wave mixing by read-out beam.** Rustamov, F.A. (Baku State Univ., (Azerbaijan). Physics Dept.); Sadykhov, E.A.; Sharbatov, V.KH. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. FREQUENCY MIXING/optimization; BORON OXIDES; CRYSTALS; DIFFRACTION GRATINGS; OPTIMIZATION; GAIN; HELIUM-NEON LASERS; SULFUR OXIDES

13404 (INIS-mf–13749, pp. 65) **Possibility of metal surface probing by nonlinear optic response.** Kulagin, I.A. (NOP 'Akadempribor', Academy of Sciences of Uzbekistan, Akademgorodok, Taskent, (Uzbekistan)); Lugovskoy, A.V.; Usmanov, T.; Zinoviev, A.V. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METALS/nonlinear optics; DISTRIBUTION FUNCTIONS; EXCITATION; METALS; OPTICAL DISPERSION; PROBES; RELAXATION TIME; SURFACES

13405 (INIS-mf–13780, pp. 54-55) **Measurement of transperent thin films thickness by modulating interfering pattern of light on slabs.** Tavassoli, M.T. (Tehran Univ., (Iran, Islamic Republic of) Dept. of Physics); Kargar, M.; Asadi, H. Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THIN FILMS/laser radiation; INTERFERENCE; REFRACTIVE INDEX; SLABS; THICKNESS

13406 (INIS-mf–13780, pp. 56) **Vacuum field fluctuation and spontaneous emission in a dielectric slab.** Khosravi, M. (Razi Univ., Kermanshah (Iran, Islamic Republic of)). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DIELECTRIC MATERIALS/superradiance; SUPERRADIANCE; ELECTROMAGNETIC FIELDS; FLUCTUATIONS; QUANTIZATION

13407 (INIS-mf–13799, pp. 51-73) **Status of solid state lasers in the visible and near infrared.** Weber, H. (Technische Univ. Berlin, Berlin (Germany). Optisches Inst.). International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Hundreds of solid state Lasers cover more or less the visible and near infrared spectrum. Only a few of them are of major interest. Among them the Ti-Sapphire, Cr-Alexandrite, Nd-YAG, Er-YAG. Due to new concepts (slabs, annular rods diode pumping, unstable resonators) the relevant parameters as output power, efficiency and beam quality have been improved considerably during the recent years. Highlights are the kW-Nd-YAG laser and the tunable, flashlamp pumped Alexandrite and Sapphire systems. In the near future diode pumped systems of high beam quality and high spectral stability in the 100 W-range will become available. (author). 19 refs, 10 figs, 5 tabs.

13408 (INIS-mf–13799, pp. 75-86) **Investigation of potential laser systems for the LIDAR Thomson scattering technique.** Selden, A.C. (AEA Fusion, Culham Lab., Abingdon (United Kingdom)); Evans, D.E.; Forrest, M.J. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A survey of current/advanced laser systems of potential interest for LIDAR Thomson scattering diagnostics of large scale fusion plasmas will be presented, covering both visible and infra red sources with pulse repetition rates ranging from Hz to kHz. Techniques for pulse generation, pulse shaping and ASE noise suppression will be reviewed with respect to the special requirements of LIDAR, pointing out the important contributions of non-linear optics in this field. The possible application of high p.r.f. laser sources to plasma diagnostics will also be discussed. (author). 26 refs, 3 figs, 3 tabs.

13409 (INIS-RU–364, pp. 39) **Mechanism of diabatic excitation of electrons in crack propagation in metals.** Belen'kij, A.Ya. (Tsentral'nyj Nauchno-Issledovatel'skij Inst. Chernoj Metallurgii, Moscow (Russian Federation)). AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. COLD FUSION/crack propagation; DIABATIC APPROXIMATION; ELECTRIC FIELDS; ELECTRONS; EXCITATION; MATHEMATICAL MODELS; METALS; PHOTOEMISSION; SPATIAL DISTRIBUTION; THERMONUCLEAR REACTIONS

13410 (INIS-RU–370, pp. 9-18) **On relative biological efficiency of tritiated water.** Shtukkenberg, Yu.M. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the analysis of experiments in the estimation of RBE HTO and n_f fission neutrons related to different conditions of irradiation and biological tests are presented. RBE HTO and n_f are shown to be similar at D<100 rad. These values increase rapidly with D reduction from 50 rad and prolonged irradiation period. The lowest RBE HTO are observed at the sex cells exposure and genetic effects (1,5-5), higher values occurs due to the damages in somatic cells of hemopoietic and immune organs (6-12) and the highest ones - at the delayed effects: the loss of the average lifespan and malignant tumors appearance. Relative to these patterns RBE n_f amount to 100 and higher values at low dosses and prolonged exposures. RBE HTO are lower. The review shows, that HTO effects differ from γ-rays exposure qualitatively, as HTO induces larger number of irreversible damages in DNA similar to damages associated with high-LET radiation, which yield malignant tumor induction even due to low doses egual to 5-10 rad. 30 refs.; 5 figs.; 4 tabs.

13411 (INP-MSU–93-3-295) **Spatial fluctuations of particle fluxes within the auroral zone inferred from the Intercosmos-Bulgaria-1300 satellite data.** Antonova, E.E.; Stepanova, M.V.; Tel'tzov, M.V. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1993. 28p. (NIIYaF-MGU–93-3-295.). Order Number DE94615858. Source: OSTI; NTIS (US Sales Only); INIS.

The influence of electric field turbulence within the magnetospheric plasma sheet on the auroral particle fluctuations is analysed on the Intercosmos-Bulgaria-1300 satellite data base. It is shown that the spatial fluctuation spectrums of particle fluxes have been a power form where power index is greatly dependent on the particle energy. 23 refs.; 10 figs.; 1 tab.

13412 (IPNO-TH–93-06) **Motion and trajectories of particles around three-dimensional black holes.** Farina, C. (Universidade Federal, Rio de Janeiro, RJ (Brazil). Inst. de Fisica); Segui-Santonja, A.J.; Gamboa, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Feb 1993. 9p. (DFTUZ–93/01.). Order Number DE94618439. Source: OSTI; NTIS (US Sales Only); INIS.

The motion of relativistic particles around three dimensional black holes following the Hamilton-Jacobi formalism is studied. It follows that the Hamilton-Jacobi equation can be separated and reduced by quadratures in analogy with the four-dimensional case. It is shown that particles are trapped by the black hole independently of their energy and angular momentum, and matter always falls to the centre of the black hole and cannot undertake a motion with stable orbits as in four dimensions. For the extreme values of the angular momentum of the black hole, exact solutions have been found for the equations of motion and trajectories of a test particle. (author) 11 refs.

13413 (JINR–3-93-60, pp. 26-31) **On the induced radiation caused by a charged relativistic particle below Cherenkov threshold in gas.** Tyapkin, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (In Russian). In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The idea of new mechanism of induced coherent radiation by the atoms of a gas under Cherenkov threshold is suggested in this paper. This radiation must be emitted strictly in the direction of the movement of the charged particle, because it is provoked by the induced action of the field emitted by excited atoms along the relativistic particle track. It is emphasized that the last experimental investigation contains some indications of such radiation. An experiment for full evidence of the existance of this mechanism of pecular 'laser' discharge of the excited gas atoms along the relativistic particle track is proposed. The investigation has been performed at the Particle Physics Laboratory, JINR. 7 refs.

13414 (LA-UR–93-4375) **Workshop on advances in smooth particle hydrodynamics.** Wingate, C.A.; Miller, W.A. Los Alamos National Lab., NM (United States). [1993]. 418p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9309337–1: Workshop on advances in smooth particle hydrodynamics, Los Alamos, NM (United States), 21-23 Sep 1993). Order Number DE94006221. Source: OSTI; NTIS; GPO Dep.

Contains vugraphs.

This proceedings contains viewgraphs presented at the 1993 workshop held at Los Alamos National Laboratory. Discussed topics include: negative stress, reactive flow calculations, interface problems, boundaries and interfaces, energy conservation in viscous flows, linked penetration calculations, stability and consistency of the SPH method, instabilities, wall heating and conservative smoothing, tensors, tidal disruption of stars, breaking the 10,000,000 particle limit, modelling relativistic collapse, SPH without H, relativistic KSPH avoidance of velocity based kernels, tidal compression and disruption of stars near a supermassive rotation black hole, and finally relativistic SPH viscosity and energy.

13415 (LA-UR–94-614) **Supernova explosions and hydrodynamical instabilities: From core bounce to 90 days.** Benz, W. (Steward Observatory, Tucson, AZ (United States)); Colgate, S.A.; Herant, M. Los Alamos National Lab., NM (United States). 8 Jan 1993. 27p. Sponsored by National Aeronautics and Space Administration, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant AST-0206378. (CONF-9305289–2: Center for Nonlinear Studies international conference on modeling the forces of nature, Los Alamos, NM (United States), 17-21 May 1993). Order Number DE94007562. Source: OSTI; NTIS; GPO Dep.

Since the advent of SN 1987A considerable progress has been made in our understanding of supernova explosions. It is now realized that they are intrinsically multidimensional in nature due to the various hydrodynamical instabilities which take place at almost all stages of the explosion. These instabilities not only modify the observables from the supernova, but are also thought to be at the heart of the supernova mechanism itself, in a way which guarantees robust and self-regulated explosions. In this paper, we review these instabilities placing them into their appropriate context and identifying their role in the genesis of core collapse supernovas.

13416 (LA-UR–94-691) **Statistics of time averaged atmospheric scintillation.** Stroud, P. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940449–1: Society of Photo-Optical Instrumentation Engineers conference on intelligent information systems, Orlando, FL (United States), 4-8 Apr 1994). Order Number DE94006998. Source: OSTI; NTIS; GPO Dep.

A formulation has been constructed to recover the statistics of the moving average of the scintillation Strehl from a discrete set of measurements. A program of airborne atmospheric propagation measurements was analyzed to find the correlation function of the relative intensity over displaced propagation paths. The variance in continuous moving averages of the relative intensity was then found in terms of the correlation functions. An empirical formulation of the variance of the continuous moving average of the scintillation Strehl has been constructed. The resulting characterization of the variance of the finite time averaged Strehl ratios is being used to assess the performance of an airborne laser system.

13417 (LYCEN–9304) **Statistical mechanics of a q-deformed boson gas.** Tuszynski, J.A.; Rubin, J.L.; Meyer, J.; Kibler, M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Feb 1993. 12p. Order Number DE94618440. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters, (Section) A (NL).

Statistical properties of a noninteracting q-boson system are considered. The accent is put on D=2 and D=3 dimensions. First the mean occupation numbers for the energy levels are given. Subsequently, expressions are derived for the total energy, the specific heat, the entropy and the equation of state. The results differ from the standard ones for ordinary bosons (but converge to them as $q \rightarrow 1$). In particular, it is found that Bose condensation may occur in D=2 dimensions when $q \neq 1$. (author) 18 refs.

13418 (LYCEN–9315) **D and f electrons in a qp-quantized cubical field.** Kibler, M.; Sztucki, J. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Mar 1993. 12p. (CONF-9303266–: Winter workshop on spectroscopy and structure of rare earth systems, Karpacz (Poland), 25-28 Mar 1993). Order Number DE94618441. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Acta Physica Polonica, Series A (PL).

A procedure for qp-quantizing a crystal-field potential V with an arbitrary symmetry G is developed. Such a procedure is applied to the case where V involves cubic components (G=0) of the degrees 4 and 6. This case corresponds to d and f electrons in a qp-quantized cubical potential. It is shown that the qp-quantization of the considered cubical potential is equivalent to a symmetry breaking of type $O \rightarrow D_4$. A general conjecture about this symmetry breaking phenomenon is given. (author) 21 refs.

13419 (NIIYaF-MGU–91-4-208) **Exactly solvable extensions of the Dicke model.** Inozemtseva, N.G.; Sadovnikov, B.I. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1991. 15p. (In Russian). Order Number DE94616637. Source: OSTI; NTIS (US Sales Only); INIS.

Consideration is given to the problem of determining additional integrals of motion for the class of hamiltonians, bilinear with respect to random L+1 realizations of U(n) algebra. It is shown that such integrals exist both in symmetrical Gaudin case and in some limiting cases, corresponding to problems of linear interaction of L-quantum n-level sources with (n-1) resonance modes of electromagnetic field. 8 refs.

13420 (SLAC-PUB–6405) **The evolutionary status of PSR 1259-63.** Cominsky, L. (Sonoma State Univ., Rohnert Park, CA (United States). Dept. of Physics and Astronomy). Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9310283–1: 4. Maryland conference on astrophysics, College Park, MD (United States), 11-13 Oct 1993). Order Number DE94007094. Source: OSTI; NTIS; GPO Dep.

The PSR 1259–63 system is unique in that it is the first radio pulsar found to be in a binary system with a massive main sequence companion. As such, it may be the evolutionary missing link connecting the radio pulsars to the X-ray emitting Be binaries. In this paper, we consider the conditions under which PSR 1259-63 may be the progenitor of the less eccentric, more slowly rotating X-ray Be binaries such as 4U0115+63, A0535+26, and A0538-66. Scenarios invoking the interaction of the pulsar with the stellar wind of the companion are proposed to account for the rapid spin-down phase that must occur in this system if it is evolutionarily linked to accreting X-ray binaries. The unexpected X-ray emission observed from PSR 1259–63 may indicate that the interaction between the pulsar and the Be star occurs at greater distances and produces a greater spin-down efficiency than has been previously calculated.

13421 (SLAC-PUB–6406) **An April 1991 outburst from 4U0115+63 observed by BATSE.** Cominsky, L. (Sonoma State Univ., Rohnert Park, CA (United States). Dept. of Physics and Astronomy); Roberts, M.; Finger, M.H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1993. 3p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC03-76SF00515. Grant NAG 5-2032. (CONF-9309330–1: 2. Compton symposium, College Park, MD (United States), 20-22 Sep 1993). Order Number DE94007093. Source: OSTI; NTIS; GPO Dep.

4U0115+63 is a recurrent transient X-ray pulsar in a moderately eccentric orbit with a Be star companion, V635 Cas. Many outbursts from this system have been reported over the past twenty years; yet despite the apparent relation between optical outbursts from the companion star and subsequent X-ray transient events, the physical mechanism for the mass transfer in the system remains unclear. In this paper, the authors present the preliminary results of analysis of observations made using BATSE during the 1991 April outburst from this system. This outburst does not fit the pattern of three year recurrence intervals previously suggested by Whitlock, Roussel-Dupre and Priedhorsky (1989). The orbital elements of the system have been updated and do not support the claim of Tamura et al., (1992) that apsidal motion was detected in this system based on the 1990 Ginga outburst.

13422 (UCRL-JC–112218) **Coupled-mode theory of vertically integrated impedence-matched waveguide/photodetectors.** Wright, E.M. (Arizona Univ., Tucson, AZ (United States). Optical Sciences Center); Hawkins, R.J.; Deri, R.J. Lawrence Livermore National Lab., CA (United States). Dec 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930332–2: Optical Society of America integrated photonics research topical meeting, Palm Springs, CA (United States), 22-25 Mar 1993). Order Number DE94007456. Source: OSTI; NTIS; GPO Dep.

The future success of guided-wave optoelectronic circuits relies on the development of efficient photodetectors. Reducing the detector length is a key issue in the development of efficient waveguide photodetectors. In response to the need for shorter detector lengths Deri and Wada proposed the Vertically Integrated Impedence-Matched waveguide/photodetector, or VIM diode, in which a thin matching-layer is inserted between the waveguide core and the absorbing layer. VIM diode operation can be modelled as a two-step process. The field coupled into the waveguide is transferred to the matching layer in the double-moded waveguide/matching-layer structure prior to the absorbing region. By judicious choice of the extended-matching-layer length M the optical power than can be concentrated very close to the absorber thereby greatly increasing the evanescent coupling to the absorber and reducing the device length reductions of 500% over conventional structures have been reported by Deri et al. in agreement with numerical simulations using the BPM. In this talk we shall present a simple coupled-mode theory (CMT) which provides a particularly convenient way of understanding the physics of VIM devices. For example, the CMT exposes the relation between the spatial absorption transients seen in experiments and BPM simulations, and the nonhermitian properties of the under-lying modes of the problem. Furthermore, CMT allows one to reduce the parameter space of the problem and to extract the key parameters for device optimization, a formidable if not impossible task based on time-consuming BPM simulations alone. Using the CMT we have discovered a new regime of operation of VIM devices in which spatial transients can be eliminated so that the diode absorption is exponential as in conventional devices.

13423 (UCRL-JC–114984) **Gamma-ray optical counterpart search experiment (GROCSE).** Akerlof, C. (Michigan Univ., Ann Arbor, MI (United States)); Fatuzzo, M.; Lee, B.; Bionta, R.; Ledebuhr, A.; Park, H.S.; Barthelmy, S.; Cline, T.; Gehrels, N. Lawrence Livermore National Lab., CA (United States). 15 Dec 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9310252–5: 2. gamma-ray burst workshop, Huntsville, AL (United States), 20-22 Oct 1993). Order Number DE94007124. Source: OSTI; NTIS; GPO Dep.

The requirements of a gamma-ray burst optical counterpart detector are reviewed. By taking advantage of real-time notification of bursts, new instruments can make sensitive searches while the gamma-ray transient is still in progress. A wide field of view camera at Livermore National Laboratories has recently been adapted for detecting GRB optical counterparts to a limiting magnitude of 8. A more sensitive camera, capable of reaching $m_{upsilon} = 14$, is under development.

13424 (UCRL-JC–115464) **Winds from disks in compact binaries.** Mauche, C.W. Lawrence Livermore National Lab., CA (United States). 27 Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9307167–1: 105. annual meeting of the Astronomical Society of the Pacific, San Diego, CA (United States), 10-15 Jul 1993). Order Number DE94007452. Source: OSTI; NTIS; GPO Dep.

We herein present an observational and theoretical review of the winds of compact binaries. After a brief consideration of the accretion disk coronae and winds of X-ray binaries, the review concentrates on the winds of cataclysmic variables (CVs). Specifically, we consider the related problems of the geometry and mass-loss rate of the winds of CVs, their ionization state and variability, and the results from studies of eclipsing CVs. Finally, the properties of bona fide accretion disk wind models are reviewed.

6620 Physics of Elementary Particles and Fields

13425 (INIS-RU–362) **Proceedings of 2. Working meeting 'Physics at VLEPP'. V.1: Volume 1.** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 194p. (In Russian, English). (CONF-9206427–: 2. working meeting on physics at VLEPP, Protvino (Russian Federation), 2 Jun 1992). Order Number DE94616200. Source: OSTI; NTIS (US Sales Only); INIS.

Proceedings of the 2. Working meeting 'Physics at VLEPP' which has been carried out on 2-4 June of 1992 has been published. Research programm at coming e^+e^- colliders has been considered, it comparison has been fulfilled. The problems of quantum chromodynamics, supersymmetry, search for new particles, physics of t-quarks has been discussed.

13426 (INIS-RU–363) **Proceedings of 2. Working meeting 'Physics at VLEPP'. V.2: Volume 2.** Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 171p. (In Russian, English). (CONF-9206427–: 2. working meeting on physics at VLEPP, Protvino (Russian Federation), 2 Jun 1992). Order Number DE94616167. Source: OSTI; NTIS (US Sales Only); INIS.

Proceedings of the 2. Working meeting 'Physics at VLEPP' has been published. Research programm at coming e^+e^- colliders has been considered. The problems of quantum chromodynamics supersymmetry, search for new particles, physics of t-quarks has been discussed. The problems of creation of coordinate-sensitive and microstrip detectors for linear colliders has been considered.

13427 (LBL–90-Rev.) **A guide to experimental elementary particle physics literature, 1988–1992: Revision.** Alekhin, S.I. (Institute for High Energy Physics, Protvino, Moscow Region (Russian Federation)); Ezhela, V.V.; Filimonov, B.B. Lawrence Berkeley Lab., CA (United States). Sep 1993. 468p. Sponsored by USDOE, Washington, DC (United States);Russian Foundation for Fundamental Investigations (Russian Federation). DOE Contract AC03-76SF00098. Order Number DE94007445. Source: OSTI; NTIS; INIS; GPO Dep.

We present an indexed guide to the literature experimental particle physics for the years 1988–1992. About 4,000 papers are indexed by Beam/Target/Momentum, Reaction Momentum (including the final state), Final State Particle, and Accelerator/Detector/Experiment. All indices are cross-referenced to the paper's title and reference in the ID/Reference/Title Index. The information in this guide is also publicly available from a regularly updated computer database.

6621 General Theory of Particles and Fields

Refer also to citation(s) 13347, 13515, 13517, 13523, 13545, 13546, 13551, 13652

13428 (BNL–52389, pp. 140-146) **No-lose "theorem" for parity violating nucleon-nucleon scattering experiments.** Goldman, T. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A purely left-chiral model of the weak interactions is used to show that the total parity-violating asymmetry in quark-quark scattering must grow with increasing energy. In the absence of other new physics, non-observation of a large asymmetry can therefore be used to infer an upper bound on the mass scale for new right-chiral weak vector bosons. Applying this idea to actual nucleon-nucleon scattering requires more involved calculations, as the dominant contribution appears to come from a component of diquark-quark scattering related to, but not identical to, wavefunction-mixing. Earlier criticism of this model by Simonius and Unger is refuted, and a new calculation is proposed as an additional check on the result. Finally, the author argues that the so-called "spin crisis" does not affect the conclusions.

13429 (BONN-HE–93-05) **Fusion algebras of fermionic rational conformal field theories via a generalized Verlinde formula.** Eholzer, W.; Huber, R. Bonn Univ. (Germany). Physikalisches Inst. Jul 1993. 28p. (HEP-TH–9307031). Order Number DE94747628. Source: OSTI; NTIS (US Sales Only); INIS.

We prove a generalization of the Verlinde formula to fermionic rational conformal field theories. The fusion coefficients of the fermionic theory are equal to sums of fusion coefficients of its bosonic projection. In particular, fusion coefficients of the fermionic theory connecting two conjugate Ramond fields with the identity are either one or two. Therefore, one is forced to weaken the axioms of fusion algebras for fermionic theories. We show that in the special case of fermionic W(2, δ)-algebras these coefficients are given by the dimensions of the irreducible representations of the horizontal subalgebra on the highest weight. As concrete examples we discuss fusion algebras of rational models of fermionic W(2, δ)-algebras including minimal models of the N=1 super Virasoro algebra as well as N=1 super W-algebras SW(3/2, δ). (orig.)

13430 (BONN-HE–93-14) **On the completeness of the set of classical W-algebras obtained from DS reductions.** Feher, L. (Bonn Univ. (Germany). Physikalisches Inst.); O'Raifeartaigh, L.; Ruelle, P.; Tsutsui, I. Bonn Univ. (Germany). Physikalisches Inst. Apr 1993. 49p. Order Number DE94752364. Source: OSTI; NTIS (US Sales Only); INIS.

We clarify the notions of the DS-generalized Drinfeld-Sokolov-reduction approach to classical W-algebras and collect evidence supporting the conjecture that the canonical W-algebras (called W_S^G-algebras), defined by the highest weights of the sl(2) embeddings S contains or equal to G into the simple Lie algebras, essentially exhaust the set of W-algebras that may be obtained by reducing the affine Kac-Moody (KM) Poisson bracket algebras in this approach. We first prove that an sl(2) embedding S contains or equal to G can be associated to every DS reduction and then derive restrictions on the possible cases belonging to the same sl(2) embedding. We find examples of noncanonical DS reductions, but in all those examples the resultant noncanonical W-algebra decouples into the direct product of the corresponding W_S^G-algebra and a system of 'free fields' with conformal weights Δ element of {0, 1/2, 1}. We also show that if the conformal weights of the generators of a W-algebra obtained from DS reduction are nonnegative $\Delta \geq 0$ (which is the case for all DS reductions known to date), then the $\Delta \geq 3/2$ subsectors of the weights are necessarily the same as in the corresponding W_S^G-algebra. The paper is concluded by a list of open problems concerning DS reductions and more general Hamiltonian KM reductions. (orig.)

13431 (BUDKERINP–92-83) **Relaxation of the density matrix for an arbitrary spin in random external fields.** Khriplovich, I.B. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 12p. Order Number DE94618457. Source: OSTI; NTIS (US Sales Only); INIS.

The relaxation of the density matric for an arbitrary spin S under magnetic noise is independent of S under the assumption that the g-factor is S-independent. However, the decrements of polarization moments increase with the multipolarity l as l(l+1). For isotropic noise created by external fields of arbitrary multipolarities the relaxation is also S-independent in the classical limit $S \to \infty$ under the analogous assumption. In the case of anisotropic noise of the multipolarity higher than unity the relaxation of a pure state is described in the limit $S >> l >> 1$ by the heat equation. Here under the same assumption the relaxation falls off at $S \to \infty$ as l/S^2. If no such assumption on the S-dependence of the interaction parameters is made, the relaxarion under magnetic noise and arbitrary isotropic one may depend on S, but this dependence remains smooth in the limit $S \to \infty$. 5 refs.

13432 (CEA-CONF–11435) **Old and new topics in conformal field theory.** Zuber, J.B. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 58p. (CONF-9105440–: ICTP-BCSPIN Kathmandu Summer School, Kathmandu (Nepal), 19 May - 1 jun 1991). Order Number DE94618458. Source: OSTI; NTIS (US Sales Only); INIS.

These notes reflect the structure of the lectures given at the Kathmandu Summer School. They are made of two parts: the first

is intended to be an elementary (and standard) introduction to conformal field theory, following the approach of Belavin, Polyakov and Zamolodchikov [1], together with a short and biaised review of some significant results. For the sake of brevity, the author shall not provide detailed references in that part. The second part presents some recent developments on some relations between c.f.t. and classical integrable systems (of KdV type), the so-called W-algebras and related results on the structure of singular vectors. (author).

13433 (CEA-CONF–11436) **Towards a classification of fusion rule algebras in rational conformal field theories.** Ravanini, F. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Caselle, M.; Ponzano, G. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 18p. (CONF-9106454–: Conference on Advanced Quantum Field Theory and Critical Phenomena, Como (Italy), 17-21 Jun 1991). Order Number DE94618459. Source: OSTI; NTIS (US Sales Only); INIS.

We review the main topics concerning Fusion Rule Algebras (FRA) of Rational Conformal Field Theories. After an exposition of their general properties, we examine known results on the complete classification for low number of fields (≤ 4). We then turn our attention to FRA's generated polynomially by one (real) fundamental field, for which a classification is known. Attempting to generalize this result, we describe some connections between FRA's and Graph Theory. The possibility to get new results on the subject following this "graph" approach is briefly discussed. (author).

13434 (CEA-CONF–11437) **Geometry of differential equations and projective representations of the Witt algebra.** Itzykson, C. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 39p. (CONF-9106454–: Conference on Advanced Quantum Field Theory and Critical Phenomena, Como (Italy), 17-21 Jun 1991). Order Number DE94618460. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper, the authors give explicit expressions for the singular vectors in highest weight representations of the Virasoro algebra using a precise definition of fusion. (author).

13435 (CEA-CONF–11440) **Quantum symmetries in 2D massive field theories.** Bernard, D. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 45p. (CONF-9107225–: NATO Advanced Study Institute: New symmetry principles in quantum field theory, Cargese (France), 16-27 Jul 1991; SPhT–91-24.). Order Number DE94618462. Source: OSTI; NTIS (US Sales Only); INIS.

The author reviews various aspects of (infinite) quantum group symmetries in 2D massive quantum field theories. He discusses how these symmetries can be used to exactly solve the integrable models. A possible way for generalizing to three dimensions is shortly described. (author).

13436 (CEA-CONF–11445) **O(N) vector field theories in the double scaling limit.** Zinn-Justin, J. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1991. 12p. (CONF-9109483–: 25. International Symposium on Elementary Particle Theory, Gosen (Germany), 23-27 Sep 1991). Order Number DE94618484. Source: OSTI; NTIS (US Sales Only); INIS.

O(N) invariant vector models have been shown to possess nontrivial scaling large N limits, at least perturbatively within the loop expansion, a property they share with matrix models of 2D quantum gravity. In contrast with matrix models, however, vector models can be solved in arbitrary dimensions. We present here the analysis of field theory vector models in d dimensions and discuss the nature and form of the critical behaviour. The double scaling limit corresponds for $d>1$ to a situation where a bound state of the N-component fundamental vector field Φ, associated with the Φ^2 composite operator, becomes massless, while the field Φ itself remains massive. The limiting model can be described by an effective local interaction for the corresponding O(N) invariant field. It has a physical interpretation as describing the statistical properties of a class of branched polymers. It is hoped that the O(N) vector models, which can be investigated in their most general form, can serve as a test ground for new ideas about the behaviour of 2D quantum gravity coupled with $d>1$ matter. (author).

13437 (CEA-SPhT–91-134) **Fermions and link invariants.** Kauffman, L. (Illinois Univ., Chicago, IL (United States). Dept. of Mathematics, Statistics and Computer Science); Saleur, H. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 5 Jul 1991. 40p. Order Number DE94618463. Source: OSTI; NTIS (US Sales Only); INIS.

Various aspects of knot theory are discussed when fermionic degrees of freedom are taken into account in the braid group representations and in the state models. It is discussed how the R matrix for the Alexander polynomial arises from the Fox differential calculus, and how it is related to the quantum group $U_q gl(1,1)$. New families of solutions of the Yang Baxter equation obtained from "linear" representations of the braid group and exterior algebra are investigated. State models associated with $U_q sl(n,m)$, and in the case $n=m=1$ a state model for the multivariable Alexander polynomial are studied. Invariants of links in solid handlebodies are considered and it is shown how the non trivial topology lifts the boson fermion degeneracy is present in S^3. (author) 36 refs.

13438 (CEA-SPhT–92-134) **An introduction to Yangian symmetries.** Bernard, D. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1992. 14p. (CONF-9209445–: Conference on integrable quantum field theories, Como (Italy), 13-19 Sep 1992). Order Number DE94618464. Source: OSTI; NTIS (US Sales Only); INIS.

Some aspects of the quantum Yangians as symmetry algebras of two-dimensional quantum field theories are reviewed. They include two main issues: the first is the classical Heisenberg model, covering non-Abelian symmetries, generators of the symmetries and the semi-classical Yangians, an alternative presentation of the semi-classical Yangians, digression on Poisson-Lie groups. The second is the quantum Heisenberg chain, covering non-Abelian symmetries and the quantum Yangians, the transfer matrix and an alternative presentation of the Yangians, digression on the double Yangians. (K.A.) 15 refs.

13439 (DESY–93-018) **Quantum symmetry in quantum theory.** Schomerus, V. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 56p. Order Number DE94752384. Source: OSTI; NTIS (US Sales Only); INIS.

Symmetry concepts have always been of great importance for physical problems like explicit calculations, classification or model building. More recently, new 'quantum symmetries' ((quasi) quantum groups) attracted much interest in quantum theory. It is shown that all these quantum symmetries permit a conventional formulation as symmetry in quantum mechanics. Symmetry transformations can act on the Hilbert space H of physical states such that the ground state is invariant and field operators transform covariantly. Models show that one must allow for 'truncation' in the tensor product of representations of a quantum symmetry. This means that the dimension of the tensor product of two representations of dimension σ_1 and σ_2 may be strictly smaller than $\sigma_1\sigma_2$. Consistency of the transformation law of field operators local braid relations leads us to expect, that (weak) quasi quantum groups are the most general symmetries in local quantum theory. The elements of the R-matrix which appears in these local braid relations turn out to be operators on H in general. It will be explained in detail how examples of field algebras with weak quasi quantum group symmetry can be obtained. Given a set of observable field with a finite number of superselection sectors, a quantum symmetry together with a complete set of covariant field operators which obey local braid relations are constructed. A covariant transformation law for adjoint fields is not automatic but will follow when the existence of an appropriate antipode is assumed. At the example of the chiral critical Ising model, non-uniqueness of the quantum symmetry will be demonstrated. Generalized quantum symmetries yield examples of gauge symmetries in non-commutative geometry. In the case of (weak) quasi quantum groups which are only quasi-co-associative rather than co-associative, a quasi-associative generalization of non-commutative differential geometry appears naturally.

13440 (DESY–93-025) **Is the chiral phase transition in non-compact lattice QED driven by monopole condensation?.** Goeckeler, M. (Technische Hochschule Aachen (Germany). Inst. fuer Theoretische Physik); Horsley, R.; Rakow, P.E.L.; Schierholz, G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Mar 1993. 23p. (HLRZ–93-12; FUB-HEP–6/93). Order Number DE94752376. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the recent conjecture that the chiral phase transition in non-compact lattice QED is driven by monopole condensation. The comparison of analytic and numerical results shows that we have a quantitative understanding of monopoles in both the quenched and dynamical cases. We can rule out monopole condensation. (orig.)

13441 (DESY–93-049) **Towards finiteness without supersymmetry.** Skarke, H. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Apr 1993. 17p. (ITP-UH–2/93; TUW–93-04). Order Number DE94752462. Source: OSTI; NTIS (US Sales Only); INIS.

Some aspects of finite quantum field theories in 3+1 dimensions are discussed. A model with non-supersymmetric particle content and vanishing one- and two-loop beta functions for the gauge coupling and one-loop beta functions for Yukawa-couplings is presented. (orig.)

13442 (DESY–93-050) **Space-time supersymmetry of extended fermionic strings in 2 + 2 dimensions.** Ketov, S.V. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Apr 1993. 31p. (ITP-UH–1/93). Order Number DE94752470. Source: OSTI; NTIS (US Sales Only); INIS.

The N = 2 fermionic string theory is revisited in light of its recently proposed equivalence to the non-compact N = 4 fermionic string model. The issues of space-time Lorentz covariance and supersymmetry for the BRST quantized N = 2 strings living in uncompactified 2 + 2 dimensions are discussed. The equivalent local quantum supersymmetric field theory appears to be the most transparent way to represent the space-time symmetries of the extended fermionic strings and their interactions. Our considerations support the Siegel's ideas about the presence of SO(2,2) Lorentz symmetry as well as at least two self-dual space-time supersymmetries in the theory of the N = 2(4) fermionic strings, though we do not have a compelling reason to argue about the necessity of the maximal space-time supersymmetry. The world-sheet arguments about the absence of all string massive modes in the physical spectrum, and the vanishing of all string-loop amplitudes in the Polyakov approach, are given on the basis of general consistency of the theory. (orig.)

13443 (DESY–93-070) **Nuclearity, split-property and duality for the Klein-Gordon field in curved spacetime.** Verch, R. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). May 1993. 21p. Order Number DE94752465. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclearity, Split-Property and Duality are establihed for the nets of von Neumann algebras associated with the representations of distinguished states of the massive Klein-Gordon field propagating in particular classes of curved spacetimes. (orig.)

13444 (DESY–93-083) **Equations of motion for effective lagrangians and penguins in rare B-decays.** Simma, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 34p. Order Number DE94747607. Source: OSTI; NTIS (US Sales Only); INIS.

We study the application of the classical equations of motion (EOM) within the framework of an effective low-energy Lagrangian treated at the loop level. Gauge-fixing and ghost terms, which enter naturally in the EOM, are found to lead to no physical effects - neither through operator mixing nor in matrix elements. Beyond first order in the effective interactions, contact terms have to be included when reducing the effective Lagrangian and we present an explicit procedure to construct them. Applied to (hadronic) rare B-decays, the EOM drastically simplify the effective Lagrangian and its matching to the underlying theory, and certain cancellations of large (logarithmic) contributions become more transparent. Finally, we discuss details of the 'matching' of the effective Lagrangian, which may be helpful in incorporating short distance QCD corrections in further phenomenological studies. (orig.)

13445 (DESY–93-094) **Critical exponents from the effective average action.** Tetradis, N. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Gruppe Theorie); Wetterich, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 49p. (HD-THEP–93-28). Order Number DE94752397. Source: OSTI; NTIS (US Sales Only); INIS.

We compute the critical behaviour of three-dimensional scalar theories using a new exact non-perturbative evolution equation. Our values for the critical exponents agree well with previous precision estimates. (orig.)

13446 (DESY–93-128) **High temperature phase transitions without infrared divergences.** Tetradis, N. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Wetterich, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 42p. (HD-THEP–93-36). Order Number DE94752173. Source: OSTI; NTIS (US Sales Only); INIS.

The most commonly used method for the study of high temperature phase transitions is based on the perturbative evaluation of the temperature dependent effective potential. This method becomes unreliable in the case of a second order or weakly first order phase transition, due to the appearance of infrared divergences. These divergences can be controlled through the method of the effective average action which employs renormalization group ideas. We report on the study of the high temperature phase transition for the N-component ϕ^4 theory. A detailed quantitative picture of the second order phase transition is presented, including the critical exponents for the behaviour in the vicinity of the critical temperature. An independent check of the results is obtained in the large N limit, and contact with the perturbative approach is established through the study of the Schwinger-Dyson equations. (orig.)

13447 (DESY–93-133) **A portable high-quality random number generator for lattice field theory simulations.** Luescher, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 22p. Order Number DE94747478. Source: OSTI; NTIS (US Sales Only); INIS.

The theory underlying a proposed random number generator for numerical simulations in elementary particle physics and statistical mechanics is discussed. The generator is based on an algorithm introduced by Marsaglia and Zaman, with an important added feature leading to demonstrably good statistical properties. It can be implemented exactly on any computer complying with the IEEE-754 standard for single precision floating point arithmetic. (orig.)

13448 (DESY–93-134) **Anomalous fermion number violation and numerical simulations.** Montvay, I. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 19p. (HEP-LAT–9309018). Order Number DE94752171. Source: OSTI; NTIS (US Sales Only); INIS.

After discussing the problem of lattice regularization of chiral gauge theories, a simple model for anomalous fermion number violation is formulated which can be numerically studied with present day technique. Exploratory results of numerical simulations of a two-dimensional U(1) Higgs model are presented. (orig.)

13449 (DESY–93-136) **Operator product expansion of the energy momentum tensor in 2D conformal field theories on manifolds with boundary.** Dorn, H. (Humboldt-Universitaet, Berlin (Germany). Inst. fuer Elementarteilchenphysik); Preuss, V. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 10p. (HU-Berlin-IEP–93/4). Order Number DE94751946. Source: OSTI; NTIS (US Sales Only); INIS.

Starting from the well-known expression for the trace anomaly we derive the T.T operator product expansion of the energy-momentum tensor in 2D conformal theories defined in the upper halfplane without making use of the additional condition of no energy-momentum flux across the boundary. The OPE turns out to be the same as in the absence of the boundary. For this result it is crucial that the trace anomaly is proportional to the Gauss-Bonnet

density. Some relations to the σ-model approach for open strings are discussed. (orig.)

13450 (DESY–93-145) **Sum-over-histories representation for the causal Green function of free scalar field theory.** Rudolph, O. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1993. 17p. Order Number DE94751732. Source: OSTI; NTIS (US Sales Only); INIS.

A set of Green functions $G_\alpha(x\text{-}y)$, α element of 0, 2π, for free scalar field theory is introduced, varying between the Hadamard Green function $\Delta_1(x\text{-}y)$ triple bond 0—{$\phi(x)$, $\phi(y)$}—0> and the causal Green function $G_\pi(x\text{-}y)=i\Delta(x\text{-}y)$ triple bond $\phi(x)$, $\phi(y)$. For every α element of 0, 2π a path-integral representation for G_α is obtained both in the configuration space and in the phase space of the classical relativistic particle. Especially setting $\alpha=\pi$ a sum-over-histories representation for the causal Green function is obtained. Furthermore using BRST theory an alternative path-integral representation for G_α is presented. From these path integral representations the composition laws for the G_α's are derived using a modified path decomposition expansion. (orig.)

13451 (IFT-P–051/93) **Nonadiabatic neutrino oscillations revisited.** Guzzo, M.M. (Universidade Estadual de Campinas, SP (Brazil). Inst. de Fisica); Bellando, J.; Aquino, V.M. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Aug 1993. 15p. (DRC-TH–05/93.). Order Number DE94616649. Source: OSTI; NTIS (US Sales Only); INIS.

Employing the Feynman procedure of ordered exponential operators and the stationary phase method to evaluate the multiple integrals involved, the level-crossing probability is calculated and the role of a resonance in the evolution of a two-level neutrino system analysed. This procedure is compared with more conventional ones, like the Landau's method and the Ansatz of Kuo and Pantaleone and Petcov. It is that our results reproduce the correct extreme nonadiabatic limit and give the standard solutions in the adiabatic regime for any arbitrary matter density distributions. The case of solar neutrino propagation is discussed using the standard solar model predictions for the matter distribution in the Sun. (author).

13452 (IFT-P–060-93) **Some consequences in weak processes of three generations mixing in the leptonic sector.** Peres, O.L.G. (Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil)); Pleitez, V.; Funchal, R.Z. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Oct 1993. 30p. (IFUSP-P–1074.). Order Number DE94616650. Source: OSTI; NTIS (US Sales Only); INIS.

The sensitivity of some weak processes to a Cabibbo-Kobayashi-Maskawa mixing in the leptonic sector is investigated. Values for mixing angles and masses compatible with several experimental accelerator data were found. In this context neutrino oscillations, cosmological and astrophysical consequences are discussed. (author).

13453 (IFT-P–063-93) **Shape-independent expansion for the $^3S_1$ - $^3D_1$ mixing parameter.** Adhikari, S.K. (Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil)); Tomio, L.; Mello, J.P.B.C. de; Frederico, T. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Oct 1993. 11p. Order Number DE94618450. Source: OSTI; NTIS (US Sales Only); INIS.

A low-energy shape-independent expansion is suggested for the function $[\tan(2\epsilon_{BB})/(2\,k^2)]$, where ϵ_{BB} is the Blatt-Biedenharn mixing parameter for the $^3S_1$-$^3D_1$ channel. This expansion allows an evaluation of the mixing parameters ϵ_{BB} from a knowledge of the deuteron asymptotic D to S ratio, pion mass and other low-energy observables, such as the scattering lengths, deuteron binding etc., of the nucleon-nucleon system. It is demonstrated that the correct long range behavior of the tensor potential is essential for a realistic reproduction of ϵ_{BB}. (author).

13454 (IFT-P–064-93) **Complex Kohn variational principle for two-nucleon bound-state and scattering with the tensor potential.** Araujo Junior, C.F. de; Adhikari, S.K.; Tomio, L. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Oct 1993. 20p. Order Number DE94616651. Source: OSTI; NTIS (US Sales Only); INIS.

Complex Kohn variational principle is applied to the numerical solution of the fully off-shell Lippmann-Schwinger equation for nucleon-nucleon scattering for various partial waves including the coupled $^3S_1$-$^3D_1$ channel. Analytic expressions are obtained for all the integrals in the method for a suitable choice of expansion functions. Calculations with the partial waves $^1S_0$, $^1P_1$, $^1D_2$, and $^3S_1$-$^3D_1$ of the Reid soft core potential show that the method converges faster than other solution schemes not only for the phase shift but also for the off-shell t matrix elements. It is also shown that its is trivial to modify this variational principle in order to make it suitable for bound-stage calculations. The bound-state approach is illustrated for the $^3S_1$-$^3D_1$ channel of the Reid soft-core potential for calculating the deuteron binding, wave function and the D state asymptotic parameters. (author).

13455 (IFT-P–068-93) **A three-body calculation of the ^{16}O(d,p)^{17}O reaction using a two-term separable potential for the s-wave nucleon-core interaction.** Bund, G.W. (Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil)); Ueta, K. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Nov 1993. 17p. Order Number DE94616652. Source: OSTI; NTIS (US Sales Only); INIS.

A one-term separable potential which produces the 2 $s_{1/2}$ single-particle bound state in ^{17}O generates an anomalous phase shift. The correct behaviour of the phase shift may be restored by adding a second term to the original potential. Using the two-term separable s-wave potential and also a d-wave separable potential which reproduces the $id_{5/2}$ single-particle state in ^{17}O, a three-body calculation of the ^{16}O (d,p)^{17}O reaction is performed. (author).

13456 (IFT-P–069-93) **Relativistic three-particle dynamical equations: II. Application to the trinucleon system.** Adhikari, S.K.; Tomio, L. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Nov 1993. 17p. Order Number DE94616653. Source: OSTI; NTIS (US Sales Only); INIS.

The contribution of relativistic dynamics on the neutron-deuteron scattering length and triton binding energy is calculated employing five sets tri nucleon potential models and four types of three-dimensional relativistic three-body equations suggested in the preceding paper. The relativistic correction to binding energy may vary a lot and even change sign depending on the relativistic formulation employed. The deviations of these observables from those obtained in nonrelativistic models follow the general universal trend of deviations introduced by off- and on-shell variations of two- and three-nucleon potentials in a nonrelativistic model calculation. Consequently, it will be difficult to separate unambiguously the effect of off-and on-shell variations of two and three-nucleon potentials on low-energy three-nucleon observables from the effect of relativistic dynamics. (author).

13457 (IFT-P–070-93) **Relativistic three-particle dynamical equations: I. Theoretical development.** Adhikari, S.K. (Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil)); Tomio, L.; Frederico, T. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Nov 1993. 32p. Order Number DE94616654. Source: OSTI; NTIS (US Sales Only); INIS.

Starting from the two-particle Bethe-Salpeter equation in the ladder approximation and integrating over the time component of momentum, three dimensional scattering integral equations satisfying constrains of relativistic unitarity and covariance are rederived. These equations were first derived by Weinberg and by Blankenbecler and Sugar. These two-particle equations are shown to be related by a transformation of variables. Hence it is shown to perform and relate dynamical calculation using these two equations. Similarly, starting from the Bethe-Salpeter-Faddeev equation for the three-particle system and integrating over the time component of momentum, several three dimensional three-particle scattering equations satisfying constraints of relativistic unitary and covariance are derived. Two of these three-particle equations are related by a transformation of variables as in the two-particle case. The three-particle equations obtained are very practical and suitable for performing relativistic scattering calculations. (author).

13458 (IHEP-OTF–91-13) **Three-dimensional Gross-Neveu model at nonzero temperature and in an external magnetic field.** Klimenko, K.G. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst.

Fiziki Vysokikh Ehnergij. 1991. 12p. (IFVE-OTF–91-13.). Order Number DE94618465. Source: OSTI; NTIS (US Sales Only); INIS.

The phase structure of the (2+1) Gross-Neveu model is considered in the leading order of the 1/N expantion when the temperature T and the external magnetic field H are nonzero. It is shown that for any fixed T value there exists the critical value of the magnetic field H_c, so that at $H>H_c$ the chiral invariance of the theory is spontaneously broken. For a fixed H, there exists the critical value of the temperature $T_c(H)$, so that at $T>T_c(H)$ the original symmetry of the model is restored. The phase portrait of the model is constructed in the H-T plane. 4 refs., 3 figs.

13459 (IHEP-OTF–92-143) **Variational discrete symmetries.** Lesnov, A.N.; Shabat, A.B.; Yamilov, R.I. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 10p. Order Number DE94618485. Source: OSTI; NTIS (US Sales Only); INIS.

The invertible differential substitutions that conserve the standard Poisson brackets and act on Hamiltonians in an appropriate way are considered. These canonical auto-Baecklund transformations proved to be a very simple and efficient tool in the theory of solitons. In particular, these allow one to prove a general involutivity theorem and to build up simple formulae for soliton-like solutions of (2+1)-dimensional Hamiltonian systems as well as in (1+1)-dimensional case. 7 refs.

13460 (IHEP-OTF–92-146) **The canonical symmetry for integral systems.** Lesnov, A.N.; Rasumov, A.V. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov (Russian Federation). Inst. Fiziki Vysokikh Ehnergij. 1992. 20p. Order Number DE94618486. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Math. Phys.

The properties of discrete nonlinear symmetries of integral equations are investigared. These symmetries are shown to be canonical transformations. On the basis of the considered examples, it is concluded, that the densities of the conservation laws are changed under these transformations by spatial divergencies. 11 refs.

13461 (INIS-BR–3255) **Two models 1/N treatment in quantum field theory: O(N) x O(N) and Thirring model.** Ribeiro, R.F. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 94p. (In Portuguese). Order Number DE94618451. Source: OSTI; NTIS (US Sales Only); INIS.

Two models in quantum field theory (QFT) are studied: O(N) x O(N) and the three dimensions Thirring models. No references are made to their association with phenomenological models. (L.C.J.A.).

13462 (IPNO-TH–92-25) **The ϕ^4 model near the critical point: the Gaussian variational approximation.** Kerman, A.K. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Lab. for Nuclear Science); Martin, C.; Vautherin, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1992. 15p. Contract DE-AC02-76ER03069. Order Number DE94618466. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review., D (Particles Fields) (US).

Using the Gaussian variational approximation, the approach to the continuum limit in the ϕ^4 theory in 3+1 space-time dimensions is described. The solutions of the variational equations and their stability are studied and these results are compared with those of Monte Carlo calculations on a lattice. The importance of lattice effects is investigated by putting the Gaussian wave functional on a lattice. An abrupt decrease of the fourth derivative of the effective potential in the vicinity of the critical point is found, which is consistent with Monte Carlo calculations. In the continuum limit $b \rightarrow 0^+$, the renormalized theory shows a broken phase which is degenerate with the symmetric phase. In the asymmetric phase the theory is found to be asymptotically free. (author) 10 refs.; 2 figs.

13463 (ITP–93-21E) **QCD parametrizations of the parton distribution of deep inelastic scattering.** Kotikov, A.V.; Maksimov, S.J.; Parobij, I.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. Order Number DE94616660. Source: OSTI; NTIS (US Sales Only); INIS.

A realistic parametrization of the gluon and quarks distributions is suggested. It is shown that the solutions of the Gribov-Lipatov-Altarelli-Paris equations can be presented by these parametrizations and these equations unambiguously lead to the constraints on the Q^2-evolution of the parameters. (author). 10 refs.

13464 (ITP–93-22E) **The asymptotics of matrix elements of Gaussian potential between the basis functions of three-dimensional harmonic oscillator.** Filippov, G.F.; Kosinov, A.G.; Okhrimenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. Order Number DE94618467. Source: OSTI; NTIS (US Sales Only); INIS.

The asymptotic expression may be used to calculate matrix elements of the Gaussian potential between the basis functions of three-dimensional harmonic oscillator $< n\ l\ |\ V_0 \exp[-r^2/\mu^2]\ |$ ntilde l >, starting with some values of quantum numbers n and n ≈. The asymptotic expression is found, and its behavior is investigated for different values of quantum numbers n, $n^{\downarrow}$, l and ratio μ/r_0. (author). 4 refs., 5 figs.

13465 (ITP–93-32E) **Exact multiplicities in the three-anyon spectrum.** Mashkevich, S.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 17p. Order Number DE94616768. Source: OSTI; NTIS (US Sales Only); INIS.

Using the symmetry properties of the three-anion spectrum, we obtain exactly the multiplicities of states with given energy and angular momentum. The results are shown to be in agreement with the proper quantum mechanical and semiclassical considerations, and the unexplained points are indicated. (author).15 refs. 5 tabs., 3 figs.

13466 (ITP–93-36E) **q-deformations of the Veneziano model.** Jenkovszky, L.L.; Mishchenko, A.V.; Struminskij, B.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. Order Number DE94616769. Source: OSTI; NTIS (US Sales Only); INIS.

By q-deforming the narrow-resonance Veneziano dual model, we obtain an expression for the scattering amplitude exhibiting duality, crossing symmetry and a more realistic spectrum of resonances corresponding to non-linear Regge trajectories. (author). 5 refs.

13467 (JINR–6-92-57) **JINR rapid communications: Collection.** Zarubina, M.I.; Ivashkevich, Eh.V. (eds.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. 92p. (In English, Russian). Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The collection JINR Rapid Communications includes the articles providing the problems: electroweak theory and the components of bosonic fields, the hypothesis of vector-current conservation; bremsstranhlung of proton-proton interaction and beta decay of ^{183}Tl isotope; autoduality of Jang-Mills theory and description of the position-sensitive neutron detector as a module of neutron multidetector system.

13468 (JINR–6-92-57, pp. 50-56) **The realization of Nambu-Jona-Lasinio type model on physical fields.** Vall, A.N.; Leviant, V.M.; Sinitskaya, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

Method of dynamical mapping for the Heisenberg fields onto physical fields in the four-fermion interaction Hamiltonian (nonrelativistic variant of Nambu-Jona-Lasinio model) is used to calculate: energy of physical vacuum, one-particle excitation energy spectrum, wave function and mass of the bound state of two excitations. 6 refs.

13469 (JINR–6-92-57, pp. 57-62) **On embedding of integrable equations in (1 + 1) and (2 + 1) dimensions into the generalized self-dual Yang-Mills equations.** Popov, A.D. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The generalization of the self-dual Yang-Mills (SDYM) equations on the spaces of arbitrary even dimension is considered. It is shown that all integrable equations in (1 + 1) dimensions and many integrable equations in (2 + 1) dimensiona may be obtained by the reduction of the generalized SDYM equations. 21 refs.

13470 (JINR-E–2-93-193) **Is it possible to assign physical meaning to field theory with higher derivatives?.** Chervyakov, A.M.; Nesterenko, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 20p. Order Number DE94618468. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Rev., D part. Field.

To overcome the difficulties with the energy indefiniteness in field theories with higher derivatives, it is supposed to use the mechanical analogy, the Timoshenko theory of the transverse flexural vibrations of beams or rods well known in mechanical engineering. It enables one to introduce the notion of a 'mechanical' energy in such field models that is wittingly positive definite. This approach can be applied at least to the higher derivative models which effectively describe the extended localized solutions in usual first order field theories (vortex solutions in Higgs models and so on). Any problems with a negative norm ghost states and unitarity violation do not arise here. 36 refs.

13471 (JINR-R–9-93-272) **Phasotron parameters providing the constant synchronous phase during the acceleration.** Onishchenko, L.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 8p. (In Russian). Order Number DE94618452. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zh. Ehksp. Teor. Fiz.

The analytical expressions are found for the radial dependence of magnet field parameters and for the time dependence of radio frequency, which provide the constant synchronous phase during the acceleration at phasotron. 3 refs.; 3 figs.; 1 tab.

13472 (LAPP-TH–335-91) **Extended Kac-Moody algebras and applications.** Ragoucy, E.; Sorba, P. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Apr 1991. 76p. Order Number DE94618487. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to International Journal of Modern Physics A (US).

The notion of a Kac-Moody algebra defined on the S^1 circle is extended to super Kac-Moody algebras defined on MxG_N, M being a smooth closed compact manifold of dimension greater than one, and G_N the Grassman algebra with N generators. All the central extensions of these algebras are computed. Then, for each such algebra the derivation algebra constructed from the MxG_N diffeomorphism is determined. The twists of such super Kac-Moody algebras as well as the generalization to non-compact surfaces are partially studied. Finally, the general construction is applied to the study of conformal and superconformal algebras, as well as area-preserving diffeomorphisms algebra and its supersymmetric extension. (author) 65 refs.

13473 (NIIYaF-MGU–91-14-218) **From Weyl theory to the local anisotropic space-time theory.** Bogoslovskij, G.Yu. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1991. 13p. (In Russian). Order Number DE94616661. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that Weyl's ideas concerning the local conformal invatiance are naturally realized within the fromework of relativistic theory based on Viable Finsler space-time model. This is connected with a specific propertity of Finsler metrics describing the locally anisotropic event space. In contract to the Riemann one such metrics is a conformal invariation theory finally turns out to be the Abeliam calibration theory. It satisfies the principle of corresoindence with the Einstein theory and predicts a series of non-trivial physical effects accessible for experimental testing under laboratory conditions. 13 refs.

13474 (PPPL–2957) **Are the invariance principles really truly Lorentz covariant?.** Arunasalam, V. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94007664. Source: OSTI; NTIS; INIS; GPO Dep.

It is shown that some sections of the invariance (or symmetry) principles such as the space reversal symmetry (or parity P) and time reversal symmetry T (of elementary particle and condensed matter physics, etc.) are not really truly Lorentz covariant. Indeed, I find that the Dirac-Wigner sense of Lorentz invariance is not in full compliance with the Einstein-Minkowski reguirements of the Lorentz covariance of all physical laws (i.e., the world space Mach principle).

13475 (UNICAMP-IMECC-RP–46/93) **Micro-universes and strong black-roles: a purely geometric approach to elementary particles.** Recami, E.; Raciti, F.; Rodrigues Junior, W.A.; Zanchin, V.T. Universidade Estadual de Campinas, SP (Brazil). Inst. de Matematica, Estatistica e Ciencia da Computacao. Sep 1993. 22p. Order Number DE94616655. Source: OSTI; NTIS (US Sales Only); INIS.

A panoramic view is presented of a proposed unified, bi-scale theory of gravitational and strong interactions [which is mathematically analogous to the last version of N. Rosen's bi-metric theory; and yields physical results similar to strong gravity's]. This theory, is purely geometrical in nature, adopting the methods of General Relativity for the description of hadron structure and strong interactions. In particular, hadrons are associated with strong black-holes, from the external point of view, and with micro-universes, from the internal point of view. Among the results herein presented, it should be mentioned the derivation: of confinement and asymptotic freedom from the hadron constituents; of the Yukawa behaviour for the potential at the static limit; of the strong coupling constant, and of mesonic mass spectra. (author).

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Refer also to citation(s) 13428, 13520, 13521, 13542, 13545, 13620, 13632, 13633, 13662, 13722, 13724, 13725, 13726, 13802

13476 (BNL–52389, pp. 60-67) **Hadronization in nuclear matter.** Kopeliovich, B. (Universite de Paris Sud, Orsay (France)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Nuclei are unique analyzers of the space-time development of jets at early stage. The authors argue that the gluon bremsstrahlung, rather than the color string, is the main mechanism of hadronization of highly virtual quarks produced in a hard interaction. It results in an energy- and time-independent density of energy loss, like a color string, but steeply dependent on the quark virtuality. Effects of formation zone (FZ) and color transparency (CT) substantially affect the jet quenching in a nuclear matter. The latter also plays an important role in the broadening of transverse momentum distribution of a quark passing a nucleus. Parameter-free calculations provide a good description of available data on nuclear effects in the leading hadron production in deep-inelastic lepton scattering, back-to-back high-p_T hadron pair production, broadening of the transverse momentum distribution in the Drell-Yan process of lepton pair production on nuclei.

13477 (BNL–52389, pp. 82-90) **Standard model status (In search of "new physics").** Marciano, W.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A perspective on successes and shortcomings of the standard model is given. The complementarity between direct high energy probes of new physics and lower energy searches via precision

measurements and rare reactions is described. Several illustrative examples are discussed.

13478 (BNL–52389, pp. 97-103) **Precision measurements of $\sin^2 \theta_W$.** Bernstein, R.H. (Fermi National Accelerator Lab., Batavia, IL (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This paper discusses two precision measurements of $\sin^2 \theta_W$ to be performed in the next 3-5 years. Differences in $\sin^2 \theta_W$ measured through Atomic Parity Violation and Deep-Inelastic Scattering measure the radiative corrections to the Standard Model and are powerful probes for new physics.

13479 (BNL–52389, pp. 212-216) **Quark-gluon matrix elements in high-p_T single transverse spin asymmetries.** Qiu, J. (Iowa State Univ., Ames, IA (United States)); Sterman, G. Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract FG02-87ER40371. Grant NSF-9108054; Grant NSF-9211367. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors discuss the interpretation of high-p_T single-spin asymmetry experiments in perturbative QCD. The authors suggest that these experiments can give qualitatively new information on nucleon structure.

13480 (BUDKERINP–92-11) **Methods of calculation of higher power corrections in QCD.** Grozin, A.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 24p. Order Number DE94618511. Source: OSTI; NTIS (US Sales Only); INIS.

The algorithms of calculation of higher power corrections in QCD sum rules based on the fixed-point gauge are reviewed. The systematic classification of vacuum condensates is divided heavy quark condensates and correlators and light quark ones are discussed. 8 refs.; 5 figs.

13481 (BUDKERINP–92-89) **Production of a positron and a bound electron by high-energy photon in a strong Coulomb field.** Mil'shtejn, A.I.; Strakhovenko, V.M. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 14p. Order Number DE94618501. Source: OSTI; NTIS (US Sales Only); INIS.

The cross section of e^+e^- pair creation by a high-energy photon with capture of the produced e^- in arbitr bound state of arising hydrogen-like atom is found using the quasiclassical approach with exact regard for a Coulomb field. Formulae are essentially simplified for large quantum numbers of the bound state. That parmits the authors to find the total cross section of the process.

13482 (BUDKERINP–92-97) **Introduction to the heavy quark effective theory. Part 1: Part 1.** Grozin, A.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 42p. Order Number DE94618512. Source: OSTI; NTIS (US Sales Only); INIS.

Heavy Quark Effective Theory (HQET) is a new approach to QCD problems involving a heavy quark. In the leading approximation, the heavy quark is considered as a static source of the gluon field; 1/m corrections can be systematically included in the perturbation theory. HQET also simplifies lattice simulation and sum rules analysis of heavy hadrons. 65 refs.; 11 figs.

13483 (CEA-CONF–10695) **Chiral models of low energy QCD.** Ripka, G. CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Direction des Sciences de la Matiere. 1993. 23p. (CONF-9106452–: 4. international summer school on nuclear physics at the borderlines, Rabida (Spain), 17 Jun 1991). Order Number DE94618513. Source: OSTI; NTIS (US Sales Only); INIS.

Two processes may be distinguished when a hadron propagates in a dense baryonic medium. The polarization of the medium and the change in the quark structure of the hadron. The polarization of the medium is better described in terms of colorless mesons and nucleons while the intrinsic change of the hadron is better described by quark models. It is shown how to couple the two processes. The scaling of effective Lagrangians, is related to changes in the quark constituent masses, based on the QCD scale anomaly. (author) 62 refs.

13484 (DESY–93-012) **Supersymmetric threshold corrections to the Higgs sector in the minimal supersymmetric model.** Hempfling, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 29p. (CONF-9209321–: 23. Workshop of the INFN Eloisatron Project "Properties of SUSY Particles", Erice (Italy), 28 Sep - 4 oct 1992). Order Number DE94752385. Source: OSTI; NTIS (US Sales Only); INIS.

In the minimal supersymmetric extension of the Standard Model (MSSM), the Higgs self-interactions are related to the $SU(2)_L$ x $U(1)_Y$ gauge couplings. Thus, only two additional inputs are needed in order to completely determine the Higgs sector of the theory. However, these relations acquire radiative corrections when supersymmetry (SUSY) is broken. In this paper, we investigate the phenomenological implications of the corrections due to trilinear Higgs-squark-squark interactions. (orig.)

13485 (DESY–93-055) **High energy asymptotics of multicolour QCD and two-dimensional conformal field theories.** Lipatov, L.N. (St. Petersburg Inst. of Nuclear Physics, Gatchina (Russian Federation)). Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Apr 1993. 8p. Order Number DE94752468. Source: OSTI; NTIS (US Sales Only); INIS.

In the multi-colour limit of perturbative QCD the holomorphic factorization of wave functions of compound states of n reggeized gluons in the impact parameter space is shown. The conformally invariant Hamiltonian for each holomorphic factor has a nontrivial integral of motion. The odderon in QCD is the simplest example of the composite system with these properties. (orig.)

13486 (DESY–93-074) **Gauge-invariant formulation of the S, T, and U parameters.** Degrassi, G. (Universita degli Studi di Padova Dipartimento di Fisica 'Galileo Galilei' (Italy)); Kniehl, B.A.; Sirlin, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 11p. (DFPD–93/TH/43; NYU-Th–93/06/05). Order Number DE94752396. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the bosonic contributions to the S, T, and U parameters, defined in terms of conventional self-energies, are gauge dependent in the Standard Model (SM). Moreover, T and U are divergent unless a constraint is imposed among the gauge parameters. Implications of this result for renormalization schemes of the SM are discussed. A gauge-invariant formulation of S, T, and U is proposed in the pinch-technique framework. The modified S, T, and U parameters provide a gauge-invariant parametrization of leading electroweak radiative corrections in the SM and some of its extensions. (orig.)

13487 (DESY–93-109) **Partons and QCD effects in the pomeron.** Ingelman, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 10p. Order Number DE94752399. Source: OSTI; NTIS (US Sales Only); INIS.

The quark and gluon content of the pomeron and the notion of a pomeron structure function is discussed. The pomeron is argued to be a small object and, as a consequence, small-x gluon recombination effects could be sizeable. Ways to measure the pomeron parton densities in p anti p and ep collisions are presented. (orig.)

13488 (DESY–93-144) **How well do lattice simulations reproduce the different aspects of the Geometrical Schwinger Model?.** Dilger, H. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Joos, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1993. 21p. (CONF-9310250–: LATTICE 93: international symposium on lattice field theory, Dallas, TX (United States), 12-17 Oct 1993). Order Number DE94751966. Source: OSTI; NTIS (US Sales Only); INIS.

Gauge theories with massless fermions possess an intricate nonperturbative structure mainly determined by the topology of gauge field configurations and index theorems for Dirac operators in such background fields. This part of the Standard Model of elementary

particle physics is not yet well investigated. A study of the 'Geometric Schwinger Model' (GSM) on the torus showed that this simple solvable 2-dim. model exhibits quite a few characteristic features of the non-perturbative structure. We mention the realization of chiral symmetry breaking by an axial anomaly, and the screening of a confining potential by fermions. It is the aim of our studies to investigate how well the methods of lattice approximation can reproduce these non-perturbative features of the Schwinger Model. The 'geometric' version of the SM with Dirac Kaehler fermions is particularly suited for such an investigation: While there exists a systematic lattice approximation by staggered fermions, there are also explicit expressions for the Green's functions in the continuum for comparison with the lattice results. This includes the finite volume effects of the torus. (orig.)

13489 (DOE/ER/40711–T1) **Research in theoretical high-energy physics: Progress report, September 1992–September 1993.** Greensite, J.P. San Francisco State Univ., CA (United States). Dept. of Physics and Astronomy. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-92ER40711. Order Number DE94008388. Source: OSTI; NTIS; INIS; GPO Dep.

Progress on problems in quantum gravity and QCD, made during the period 9/92–9/93, and proposed research for the coming year, are summarized. Over the last year the author has proposed a dynamic mechanism underlying the observed Lorentzian signature of spacetime, and also a new quantization scheme for gravity, based on a transfer matrix approach. This transfer matrix formulation is not only a possible solution for the well-known "problem of time" in quantum gravity, but also predicts that Newton's constant is not really a constant – it should be subject to quantum fluctuations. In addition, together with two European collaborators, the author has done some further work on the abelian projection model of quark confinement. This work in quantum gravity and QCD has been reported in various publications, and the author briefly describes each of these investigations.

13490 (DOE/ER/40757–322) **Research program in particle physics: Progress report, January 1, 1993–December 1993.** Sudarshan, E.C.G.; Dicus, D.A.; Ritchie, J.L.; Lang, K. Texas Univ., Austin, TX (United States). Center for Particle Physics. May 1993. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER40757 ; FG05-85ER40200. Order Number DE94008449. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the progress report for DOE funded support of particle physics work at the University of Texas, Austin. Support was divided between theoretical and experimental programs, and each is reviewed separately in the report. Theoretical effort was divided between three general areas: quantum gravity and mathematical physics; phenomenology; and quantum mechanics and quantum field theory. Experimental effort was primarily directed toward AGS experiments at Brookhaven, to look for rare kaon decays. AGS experiments 791 and 871 are described, along with BNL experiment 888.

13491 (FNAL/C–93/404-E) **Recent QCD results from CDF.** Huston, J. (Michigan State Univ., East Lansing, MI (United States)). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9309297–8: 23. international symposium on multiparticle dynamics, Aspen, CO (United States), 13-17 Sep 1993). Order Number DE94008270. Source: OSTI; NTIS; INIS; GPO Dep.

CDF has recently concluded a very successful 1992–93 data run in which an integrated luminosity of 21.3 pb $^{-1}$ was written to tape. The large data sample allows for a greater discovery potential for new phenomena and for better statistical and systematic precision in analysis of conventional physics. This paper summarizes some of the new results from QCD analyses for this run.

13492 (FZR–93-07(prepr.)) **Kinetics of an expanding pion gas and low-mass dilepton emission.** Kaempfer, B. (Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Inst. fuer Kern- und Hadronenphysik); Koch, P.; Pavlenko, O.P. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Mar 1993. 15p. Order Number DE94752392. Source: OSTI; NTIS (US Sales Only); INIS.

We study the space-time dependence of muon pair production from dense, non-equilibrium pion matter in the framework of a Boltzmann type transport model which properly includes effects of Bose statistics. Starting from an initially supersaturated pion gas with a large positive effective chemical potential we find that this pion chemical potential stays approximately constant during the evolution. As a consequence such a scenario leads to an increased dilepton yield near the kinematical threshold for muon pair production via pion annihilation. Depending on the lifetime of the dense hadron matter formed in relativistic heavy ion collisions, this component can e observed above the background of muon pair from resonance decays and the ρ,ωbump. In such a way the measurement of the di-muon invariant mass spectrum could help to understand the initial state and the dynamical evolution of ultrarelativistic heavy ion collisions. (orig.)

13493 (GANIL-P–93-07) **Search for colour Van der Waals force in the ^{208}Pb+^{208}Pb Mott scattering.** Villari, A.C.C. (Sao Paulo Univ., SP (Brazil). Inst. de Fisica); Lichtenthaeler Filho, R.L.; Casandjian, J.M.; Lepine-Szily, A.; Cunsolo, A.; Siemssen, R.H.; Mittig, W. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 22 Apr 1993. 13p. Order Number DE94618514. Source: OSTI; NTIS (US Sales Only); INIS.

Mott scattering of the ^{208}Pb+^{208}Pb system was measured with kinematic coincidences at energies below the Coulomb barrier. The oscillations observed at E_{lab}=873.40 and 1129.74 MeV exhibit an angular shift with respect to pure Mott scattering. Theoretical estimates including the nuclear polarizability of target and projectile, vacuum polarization, relativistic effects and electronic screening underestimate the angular shifts. The comparison of the angular shift produced by a colour Van der Waals force folded into the nuclear matter distributions of the target and projectile allows the determination of a new upper limit for the strength of this force. (author) 20 refs.; 4 figs.

13494 (IFT-P–056-93) **Relativistic di-quark model of p p-bar → K$^+$K$^-$ reaction.** Frederico, T. (Hannover Univ. (Germany). Inst. fuer Theoretische Physik); Dey, J.; Tomio, L. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Sep 1993. 16p. Order Number DE94618519. Source: OSTI; NTIS (US Sales Only); INIS.

The newly available experimental data (LEAP 92) on K K-bar production is compared with a model calculation. It is believed that the simplicity of the model makes it a useful tool for studying charm and beauty baryon production, for which also experimental data will soon be profuse. (author).

13495 (IFT-P–059-93) **Radiatively induced electron and electron-neutrino masses.** Pisano, F. (Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil)); Pleitez, V.; Tonasse, M.D. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Sep 1993. 15p. (IFUSP-P–1075.). Order Number DE94616775. Source: OSTI; NTIS (US Sales Only); INIS.

The generation of the neutrino and charged lepton masses is considered in the context of an SU(3) x U(1) electroweak model. In the minimal model at zeroth order neutrinos and one of the charged leptons are massless and the other two charged leptons are mass degenerate. In order to obtain the right mass spectrum it is necessary to add right-handed neutrinos. However, the masses of the electron and its neutrino partner arise via radiative corrections. (author).

13496 (IFT-P–066-93) **The 'silent' phase transition in mesonic bags and lattice theory.** Dey, J. (Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Physics); Dey, M.; Araujo Junior, C.F. de; Tomio, L. Instituto de Fisica Teorica (IFT), Sao Paulo, SP (Brazil). Oct 1993. 10p. Order Number DE94616852. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that even the simple bag model is able to reproduce the lattice result for the masses and the sound velocity, at finite temperature, T, suggests that the transition point depends on the nature of the meson. It would be interesting to check the last conclusion in present day finite temperature lattice theory, since different transition points seem to be indicated by particle emission T in heavy ion reactions. (author).

13497 (INIS-BR–3258) **Massless quantum electrodynamics: a variational study.** Piquini, P.C. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 59p. (In Portuguese). Order Number DE94618502. Source: OSTI; NTIS (US Sales Only); INIS.

The variational method was used to study the probable existence of a compound vacuum in quantum electrodynamics. An Ansatz containing a condensate of electron-positron pairs was investigated and an optimization equation for the condensate wave function found. (L.C.J.A.).

13498 (INIS-mf–13749, pp. 10) **Coherent states in the quantum-deformed groups SU-q(2) and SU-q(1,1) for laser systems.** Ludu, A. (Bucharest Univ., Bucharest-Magurele (Romania). Dept. of Theoretical Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications*. Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASERS/annihilation operators; LASERS/eigenstates; CASIMIR OPERATORS; HAMILTONIANS; LASERS; EIGENSTATES; SU GROUPS

13499 (INIS-mf–13780, pp. 49) **Corrections of detonation functions of heavy quarks.** Gomshi Nobary, M.A. (Razi Univ., Kermanshah (Iran, Islamic Republic of) Faculty of Science). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372*. Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. QUARKS/radiative corrections; ANALYTIC FUNCTIONS; GLUONS; QUARKS; WAVE FUNCTIONS

13500 (INP–91-80) **Critical behaviour in the model of 2D-surfaces with boundaries.** Mostovoj, M.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1991. 24p. (IYaF–91-80.). Order Number DE94618495. Source: OSTI; NTIS (US Sales Only); INIS.

Critical behaviour in the hermitian matrix model with the external matrix field of special kind is studied. The model possesses SU(Q)xSU(N-Q) symmetry and is exactly solvable. Its free energy can be interpreted in terms of random surfaces with boundaries. Three kinds of critical behaviour are shown to correspond to different ratios of the average area to the average length of all boundaries of the relevant surfaces. Properties of the surfaces with boundaries are discussed. 7 refs.; 1 fig.

13501 (IPNO-TH–92-104) **Pionic background for nucleon-nucleon observables.** Ballot, J.L. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Robilotta, M.R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1992. 42p. Order Number DE94618520. Source: OSTI; NTIS (US Sales Only); INIS.

A method is presented that allows the unambiguous definition of the one pion exchange contribution to nucleon-nucleon scattering observables and then use it to determine those waves where values of phase shifts and mixing parameters may be understood as sums of pionic and non-pionic dynamical effects. This helps the assessment of the explicative power of the various existing phenomenological potentials and may eventually lead to ways of discriminating their effectiveness. (author) 16 refs.; 19 figs.; 2 tabs.

13502 (IPNO-TH–92-110) **How does nuclear Fermi motion modify the gluon structure function and J/ψ-leptoproduction.** Merabet, H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Mathiot, J.F.; Dolejsi, J.; Pirner, H.J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1992. 10p. Order Number DE94618521. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of the nuclear Fermi motion on the gluon structure function is calculated. Due to the steep decrease of G(x) with x in the nucleon, the ratio $G^A(x)/G(x)$ shows a steep rise already at small values of $x \geq 0.5$. The consequences of such a modified structure function on the $e(\mu)+A \rightarrow e(\mu)+J/\psi+X$ reaction are estimated at large and small lepton energies (E=280 GeV and E=30 GeV). Other effects which may modify the gluon structure function in the nucleus are discussed. (author) 13 refs.; 3 figs.

13503 (IPNO-TH–93-05) **Calculation of the Odderon intercept in perturbative QCD.** Gauron, P. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Lipatov, L.; Nicolescu, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 6p. Order Number DE94618515. Source: OSTI; NTIS (US Sales Only); INIS.

The question of the equality of hadron-hadron and hadron-antihadron cross sections at very high energies is investigated. By using a variational method combined with conformal invariant techniques it is shown that the Odderon J-plane singularity in the leading logarithmic approximation of QCD lies above 1. Therefore, in the perturbative theory the difference between hadron-hadron and antihadron-hadron interactions grows with energy. (K.A.) 11 refs.

13504 (IPNO-TH–93-08) **The breathing mode in extended Skyrme model.** Abada, A.; Merabet, H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Mar 1993. 15p. Order Number DE94618516. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review., D (Particles Fields) (US).

An extended Skyrme model was studied which includes fourth and sixth-order terms. Some static properties were explored like the Δ-nucleon mass splitting and investigate the Skyrmion breathing mode in the framework of the linear response theory. It was found that the monopole response function has a pronounced peak located at $\approx$400 MeV, which was identified as the Roper resonance N(1440). The extended Skyrme model provides a more accurate description of baryon properties compared to the standard one. (author) 30 refs.; 3 figs.; 1 tab.

13505 (ITF–92-26R) **Mixed fermion-photon condensate in gauged Numb-Jonah-Lesion model.** Gusynin, V.P.; Kushnir, V.A.; Sausedo, Eh. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 17p. (In Russian). Order Number DE94618503. Source: OSTI; NTIS (US Sales Only); INIS.

The existence of the 'magnetic' type mixed fermion-photon condensate $< e < e\psi\text{tilde}\ \delta^{\mu\nu}\ \psi\ F_{\mu\nu} >$ breaking chiral symmetry in gauged Numb-Jonah-Lesion model is shown. The renormalization constant of the composite operator $e\psi\text{tilde}\ \delta^{\mu\nu}\ \psi\ F_{\mu\nu}$ is found in the planar ladder approximation and an analytical expression for the renormalized condensate is obtained for different regions of the phase diagram. (author). 13 refs., 2 tabs.

13506 (ITF–93-3R) **Processes of the reciprocal transformation vector charged particles pairs and electron-positron pairs.** Tartakovskij, V.K.; Cherednichenko, V.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 7p. (In Russian). Order Number DE94616787. Source: OSTI; NTIS (US Sales Only); INIS.

The explicit form of the angle distributions and the total cross-sections for the processes of the reciprocal transformation of electron-positron pair and pair of vector charged particles are obtained. (author). 4 refs.

13507 (ITP–92-40E) **P-matrix description of charged particles interaction.** Babenko, V.A.; Petrov, N.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 12p. Order Number DE94616853. Source: OSTI; NTIS (US Sales Only); INIS.

The paper deals with formalism of the P-matrix description of two charged particles interaction. Separation in the explicit form of the background part corresponding to the purely Coulomb interaction in the P-matrix is proposed. Expressions for the purely Coulomb P-matrix, its poles, residues and purely Coulomb P-matrix approach eigenfunctions are obtained. (author). 12 refs.

13508 (ITP–93-8E) **Boson spectra and correlations in thermal locally equilibrium systems.** Sinyukov, Yu.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 24p. Order Number DE94616799. Source: OSTI; NTIS (US Sales Only); INIS.

The single and multi-particle inclusive spectra for locally equilibrium boson gas are studied using the method of statistical operator. In the framework of the formalism developed the thermal Wick's theorem is generalized and the analytical solution of the problem in boost-invariant approach is found. It is shown that for particles with wave-lengths greater than homogeneity length the

spectra and correlations increase essentially as compared to the results based on Bose-Einstein heat distribution. The connection between corresponding correction term and the particle spectrum in Milne's Universe is discussed. (author). 26 refs., 3 figs.

13509 (IYaF–91-46) **Reduce system in elementary particle physics. Radiative corrections.** Grozin, A.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1991. 52p. (In Russian). Order Number DE94618504. Source: OSTI; NTIS (US Sales Only); INIS.

This preprint is the last part of the problem book on using REDUCE in elementary particle physics. It contains examples of one-loop radiative corrections calculations in quantum electrodynamics and chromodynamics.

13510 (IYaF–92-2) **Integral characteristics of the magnetic bremsstrahlung.** Bajer, V.N.; Katkov, V.M.; Strakhovenko, V.M. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 15p. (In Russian). Order Number DE94616788. Source: OSTI; NTIS (US Sales Only); INIS.

New representations of the total probability and total intensity of the magnetic bremsstrahlung have been obtained in frame of the quasiclassical approach in the quantum electrodynamics which have the form of the one-fold integral where the integrans contains the elementary functions only, does not contain the oscillate functions and converge rapidly. The polarization of the radiation, radiation of the polarized electrons and the radiative polarization have been considered as well. 10 refs.; 4 figs.

13511 (JINR–6-92-57, pp. 5-8) **Left-right components of bosonic field and electroweak theory.** Fursaev, D.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Kadyshevskij, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the notion of 'chirality' in the theory with fundamental mass has a more universal meaning and is applicable not only to fermion but also to boson fields. In the framework of this approach the Higgs sector of the standard model should include apart from the 'left' isotopic doublets of scalar fields the 'right' scalar singlets as well. Possible experimental consequences of this proposal are shortly discussed. 9 refs.

13512 (JINR-E–2-92-175) **Enhancement of the Palumbo result concerning the unboundedness of the spinor QED hamiltonian from below.** Zastavenko, L.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1992. 6p. Order Number DE94618505. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the Hamiltonian of the Yukawa model with the Boson mass term is unbounded from below. 8 refs.

13513 (JINR-E–2-93-164) **Spin effects in high energy quark-quark scattering.** Goloskokov, S.V.; Selyugin, O.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 10p. Order Number DE94616800. Source: OSTI; NTIS (US Sales Only); INIS.

The spin amplitudes in high-energy quark-quark scattering at $/t/ >1$ GeV^2 are analyzed. It is shown that the gluon contributions in the QCDα_s^3 order lead to the spin-flip amplitude growing as s. This means the existence of the spin-flip part in pomeron exchange. The resulting T_f is about few per cent of the spin-non-flip contribution. The factorization of the large-distance and high-energy effects in the spin-flip amplitude is obtained. 13 refs.; 2 figs.; 1 tab.

13514 (LBL–34911) **Transport properties of quark and gluon plasmas.** Heiselberg, H. Lawrence Berkeley Lab., CA (United States). 1 Dec 1993. 13p. Sponsored by USDOE, Washington, DC (United States);Statens Naturvidenskabelige Forskningsraad, Copenhagen (Denmark);National Science Foundation, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant PHY89-21025; Grant PHY91-00283; Grant NAGW-1583. (CONF-9308181–2: Pre-equilibrium Parton dynamics, Berkeley, CA (United States), 23 Aug - 3 sep 1993). Order Number DE94007043. Source: OSTI; NTIS; INIS; GPO Dep.

The kinetic properties of relativistic quark-gluon and electron-photon plasmas are described in the weak coupling limit. The troublesome Rutherford divergence at small scattering angles is screened by Debye screening for the longitudinal or electric part of the interactions. The transverse or magnetic part of the interactions is effectively screened by Landau damping of the virtual photons and gluons transferred in the QED and QCD interactions respectively. Including screening a number of transport coefficients for QCD and QED plasmas can be calculated to leading order in the interaction strength, including rates of momentum and thermal relaxation, electrical conductivity, viscosities, flavor and spin diffusion of both high temperature and degenerate plasmas. Damping of quarks and gluons as well as color diffusion in quark-gluon plasmas is, however, shown not to be sufficiently screened and the rates depends on an infrared cut-off of order the "magnetic mass," $m_{mag} \sim g^2T$.

13515 (SLAC–428-Vol.3) **Proceedings of the 1992 workshops on high-energy physics with colliding beams: Volume 3, Electroweak symmetry breaking at colliding-beam facilities.** Rogers, J. (ed.). Stanford Linear Accelerator Center, Menlo Park, CA (United States). [1992]. 397p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-921252–Vol.3: Workshop on electro-weak symmetry breaking at colliding beam facilities; Workshop on high energy physics: search for new phenomenon at colliding beam facilities; Workshop on high energy physics: study of top quartz at colliding beam f Order Number DE94008437. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains viewgraphs on the following topics: Introduction to Electroweak Symmetry Breaking: Intermediate-Mass Higgs Bosons; Extended Higgs Sectors and Novel Searches; and Heavy Higgs Bosons and Strong WW Scattering.

6623 Specific Interactions, Decays and Processes

Refer also to citation(s) 12909, 12912, 12927, 13428, 13444, 13467, 13479, 13490, 13514, 13646, 13647, 13649, 13650, 13658, 13659, 13729, 13768, 14248

13516 (ANL-HEP-CP–94-9) **Analysis of the high energy behavior of the forward scattering parameters – σ_{tot}, ρ, and B.** Block, M.M. (Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy); Halzen, F.; Margolis, B.; White, A.R. Argonne National Lab., IL (United States); Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy; Wisconsin Univ., Madison, WI (United States). Dept. of Physics. [1993]. 28p. Sponsored by USDOE, Washington, DC (United States);Natural Sciences and Engineering Research Council of Canada, Ottawa, ON (Canada). DOE Contract W-31109-ENG-38 ; AC02-76ER02289 ; AC02-76ER00881. (CONF-9309297–4: 23. international symposium on multiparticle dynamics, Aspen, CO (United States), 13-17 Sep 1993). Order Number DE94006537. Source: OSTI; NTIS; INIS; GPO Dep.

Recent experimental results, namely, the remeasurement of the ρ value by UA4/2 at $\sqrt{s}$ = 546 GeV, together with a new analysis by the E710 group of σ_{tot}, ρ and B at $\sqrt{s}$ = 1800 GeV, as well as their measurement of σ_{tot} and B at $\sqrt{s}$ = 1020 GeV, have provided important anchor points for the high energy behavior of $\bar{p}p$ scattering. The authors analyze high energy $\bar{p}p$ and pp data, using two distinct (and dissimilar) analysis techniques: (1) asymptotic amplitude analysis, under the assumption that they have reached "asymptopia", and (2) an eikonal model whose amplitudes are designed to mimic real QCD amplitudes. The former gives strong evidence for a log (s/s_0) dependence at current energies and not $\log^2(s/s_0)$, and demonstrates that odderons are not necessary to explain the experimental data. The latter gives a unitary model for extrapolation into true 'asymptopia' from current energies, allowing them to predict the values of the total cross section at future supercolliders. Using their QCD-model, the authors obtain σ_{tot}(16 TeV)= 106 $\pm$ 4 mb and σ_{tot}(40 TeV) = 120 $\pm$ 5 mb.

13517 (ANL/PHY/PP–71811) **Chiral symmetry and the threshold $\gamma p \rightarrow \pi^0 p$ reaction.** Lee, T.S.H. (Argonne National Lab., IL (United States)); Pearce, B.C. Argonne National Lab., IL (United States). [1994]. 15p. Sponsored by USDOE, Washington,

DC (United States);Natural Sciences and Engineering Research Council of Canada, Ottawa, ON (Canada). DOE Contract W-31109-ENG-38. Order Number DE94008117. Source: OSTI; NTIS; INIS; GPO Dep.

The threshold $\gamma p \rightarrow \pi^0 p$ reaction is investigated by using a chiral invariant πN model in a unitary, gauge invariant, dynamical calculation based on a chiral Lagrangian. It is shown that the chiral invariant πN final state interaction significantly suppresses the E_{0+} amplitude from the value $-2.4 \times 10^{-3} m_{\pi}^{-1}$ predicted by the low energy theorem to $-0.66 \times 10^{-3} m_{\pi}^{-1}$. We discuss questions concerning the implications of the present results in interpreting the recent Mainz data and their multipole analysis. The experimental accuracy needed for investigating chiral symmetry breaking is illustrated.

13518 (ANL/PHY/PP–73096) **Semileptonic decays of mesons in the SO(4) model.** Iachello, F. (Yale Univ., New Haven, CT (United States). Center for Theoretical Physics); Lee, T.S.H. Argonne National Lab., IL (United States); Yale Univ., New Haven, CT (United States). Center for Theoretical Physics. [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; FG02-91ER40608. Order Number DE94008108. Source: OSTI; NTIS; INIS; GPO Dep.

We present results of a calculation of semileptonic decays of mesons in the string-like U(4) $SU_f(n)$ 0 SU_s (2) $SU_c(3)$ model with U(4) SO(4) dynamic symmetry. The calculation describes the available data as accurately as the semi-relativistic quark model. We make predictions for several exclusive decays which can be tested by future experiments.

13519 (BNL–49921) **BNL possibilities.** Pile, P.H. Brookhaven National Lab., Upton, NY (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9310259–2: U.S./Japan seminar on hyperon-nucleon interactions, Maui, HI (United States), 24-28 Oct 1993). Order Number DE94007179. Source: OSTI; NTIS; INIS; GPO Dep.

The Brookhaven National Laboratory AGS facility provides the intense kaon and pion beams necessary for detailed studies of the hyperon-nucleon interaction. A description of available beams is provided along with a summary of the current and future physics program.

13520 (BNL–52389, pp. 2-9) **Summary: Hadron dynamics sessions.** Carroll, A.S. (Brookhaven National Lab., Upton, NY (United States)); Londergan, J.T. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

At this Workshop four sessions were organized on Hadron Dynamics. The first topic, QCD Exclusive Reactions and Color Transparency, featured talks by Ralston, Heppelman and Strikman; the second, QCD and Inclusive Reactions had talks by Garvey, Speth and Kisslinger. The third dynamics session, Medium Modification of Elementary Interactions had contributions from Kopeliovich, Alves and Gyulassy; the fourth session Pre-QCD Dynamics and Scattering, had talks by Harris, Myhrer and Brown. An additional joint Spectroscopy/Dynamics session featured talks by Zumbro, Johnson and McClelland. These contributions will be reviewed briefly in this summary. Two additional joint sessions between Dynamics and η physics will be reviewed by the organizers of the Eta sessions.

13521 (BNL–52389, pp. 106-111) **Semileptonic weak interactions.** Louis, W.C. (Los Alamos National Lab., NM (United States)); Poutissou, J.M. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A program is described which proposes to measure the weak hadronic matrix elements between nucleon states with the view of extracting information on the quark observables, in particular the strange quark content of the nucleon spin.

13522 (BNL–52389, pp. 132-139) **Spin working group summary.** McClelland, J.B. (Los Alamos National Lab., NM (United States)); Heller, K. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Although the topic of spin was organized as a separate session in this workshop, it clearly permeates almost all areas of physics discussed. Spin plays a prominent role in QCD, the theory of strong interactions between spin-1/2 quarks and spin-1 gluons. Historically, there have been many examples of how polarization measurements have forced us to change the way in which physical processes are viewed. It was obvious from this workshop that there remain many important open questions in nuclear and particle physics that require further polarization measurements in the hadronic sector. Although the majority of the experiments discussed in this session involved lepton-hadron and hadron-hadron reactions, it should be emphasized that the nucleus further provides a powerful laboratory in which to test our understanding of QCD in a strongly interacting medium.

13523 (BNL–52389, pp. 147-152) **Status of the analysis of parity violation in $\vec{p}$ - N scattering at higher energies.** Simonius, M. (Institut fuer Mittelenergiephysik, Zuerich (Switzerland)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The status of the analysis of parity violation in the total cross section in proton-nucleon scattering in the multi-Gev region is reviewed. It is argued that at present the large experimental result obtained at P_{LAB} = 6GeV is not yet understood and there is no compelling reason to believe that effects will grow further (into the 10^{-5} - 10^{-4} range) at higher energies.

13524 (BNL–52389, pp. 153-160) **Parity nonconservation in proton scattering at higher energies.** Mischke, R.E. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A parity-nonconservation experiment in the scattering of longitudinally-polarized protons at an incident proton momentum of 6 GeV/c is examined. This experiment indicates a sharp rise with energy of the total cross section correlated with proton helicity that was unexpected. This energy dependence is due to the strong part of the interaction and may indicate the role of a diquark component in the nucleon. New experiments at higher energies are needed to confirm such a model. Future experiments can benefit from an analysis of sources of systematic error that have been encountered in the experiment discussed here.

13525 (BNL–52389, pp. 161-166) **TRIUMF parity violation experiments: Possible extensions to higher energies.** Oers, W.T.H. van (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The status of the TRIUMF 230 MeV parity violation measurement is reviewed. Possible other intermediate energy measurements are indicated. A new experiment at an energy of tens of GeV is needed to follow up on the earlier unexpectedly large result obtained at 5.13 GeV.

13526 (BNL–52389, pp. 167-170) **Parity violation in proton-proton scattering at COSY.** Eversheim, P.D. (Universitaet Bonn (Germany)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

At the Cooler Synchrotron COSY at Juelich two experiments testing parity violation in $\vec{p}$-p scattering are planned. The experiment at 230 MeV is p-exchange dominated giving additional independent information for the weak meson-nucleon coupling constants. The experiment at 1.5 GeV probes the energy-dependence of A_Z. Consequences for the experimental set-up are discussed.

13527 (BNL–52389, pp. 171-176) **Advantages of cooled, stored polarized beams for precision symmetry tests at multi-GeV energies.** Vigdor, S.E. (Indiana Univ., Bloomington, IN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

It is argued that recent and ongoing developments in the technology for handling polarized beams in synchrotrons and storage rings provide a unique and favorable new environment for the performance of precision polarization experiments with internal targets. After reviewing some of the relevant features of the ring environment, the author points out the inherent conceptual advantages they present for $\vec{p}$ + p parity tests and for a $\vec{p}$ + $^3\vec{H}e$ test of time reversal invariance at multi-GeV energies. Considerations of statistical and systematic errors for a parity experiment place significant demands on machine performance, which should be taken into account in the design of any new multi-GeV ring.

13528 (BNL–52389, pp. 177-183) **Parity violation experiments at RHIC.** Tannenbaum, M.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract AC02-76CH00016. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

With longitudinally polarized protons at RHIC, even a 1 month dedicated run utilizing both approved major detectors could produce a significant research for new physics in hadron collisions via parity violation. Additionally, in the energy range of RHIC, large "conventional" parity violating effects are predicted due to the direct production of the weak bosons $W^{\pm}$ and Z^0. One can even envision measurements of the spin dependent sea-quark structure functions of nucleons using the single-spin parity violating symmetry of $W^{\pm}$ and Z^0.

13529 (BNL–52389, pp. 184-188) **Parity violating electron scattering at Bates and CEBAF.** Beise, E.J. (W.K. Kellogg Radiation Lab., Pasadena, CA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. Grant PHY-91-15574. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Parity-violating electron scattering has in the past been used to measure the weak mixing $\sin^2 \theta_W$. More recently, theoretical interest in strange quark contributions to hadronic matrix elements has generated a new set of proposals to use PV electron scattering as a neutral weak probe of hadronic structure. Experiments to measure these strange quark effects are underway at the MIT-Bates Laboratory and planned for CEBAF.

13530 (BNL–52389, pp. 223-228) **Experiments to measure the gluon helicity distribution in protons.** Spinka, H. (Argonne National Lab., IL (United States)); Beddo, M.E.; Underwood, D.G. Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract W-31-109-ENG-38. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Several experiments are described that could obtain information about the gluon helicity distribution in protons. These experiments include inclusive direct-γ, direct-γ + jet, jet, and jet + jet production with colliding beams of longitudinally-polarized protons. Some rates and kinematics are also discussed.

13531 (BNL–52389, pp. 229-234) **Measuring the sea quark polarization.** Makdisi, Y. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Spin is a fundamental degree of freedom and measuring the spin structure functions of the nucleon should be a basic endeavor for hadron physics. Polarization experiments have been the domain of fixed target experiments. Over the years large transverse asymmetries have been observed where the prevailing QCD theories predicted little or no asymmetries, and conversely the latest deep inelastic scattering experiments of polarized leptons from polarized targets point to the possibility that little of the nucleon spin is carried by the valence quarks. The possibility of colliding high luminosity polarized proton beams in the Brookhaven Relativistic Heavy Ion Collider (RHIC) provides a great opportunity to extend these studies and systematically probe the spin dependent parton distributions specially to those reactions that are inaccessible to current experiments. This presentation focuses on the measurement of sea quark and possibly the strange quark polarization utilizing the approved RHIC detectors.

13532 (BNL–52389, pp. 241-246) **Exclusive polarization measurements in hyperon production.** Jacobs, W.W. (Indiana Univ., Bloomington, IN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The physics of quark vs. hadron spin degrees of freedom is discussed with regard to exclusive polarization measurements in hyperon production. Plans for exclusive near-threshold $\sqrt{s} \sim 3$ GeV measurements of the DISTO collaboration, to begin early next year, are briefly described to elucidate the different physics probed exclusively as compared to the available inclusive data set. Possibilities for higher energy exclusive measurement are briefly explored.

13533 (BNL–52389, pp. 264-269) **Polarized elastic proton-proton scattering at UNK and beyond.** Phelps, R.A. (Univ. of Michigan, Ann Arbor, MI (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A description of the near term plans for high $P^2_{\perp}$ p-p elastic scattering analyzing power measurements at the 400 GeV UNK storage ring in Russia and the long term plans for high $P^2_{\perp}$ p-p elastic scattering analyzing power and spin-spin correlation parameter measurements at 120 GeV at the Fermilab Main Injector and analyzing power measurements in the Fermilab Tevatron are presented.

13534 (BNL–52389, pp. 270-275) **The pp elastic scattering experiment at RHIC and polarization studies in the Coulomb Nuclear Interference region.** Guryn, W. (Brookhaven National

Lab., Upton, NY (United States)); Akchurin, N. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors have examined the feasibility of measuring proton proton (pp) elastic scattering at small four momentum transfer t. The application of the measurement as a polarimeter in the Coulomb Nuclear Interference (CNI) region for polarized pp collisions is discussed. In addition, other fundamental polarization phenomena can be explored by making use of the same setup. The configuration of the lattice of the Relativistic Heavy Ion Collider (RHIC) which allows the measurement of scattering in CNI region is presented. The t range of the experiment is $0.0005 < t < 0.2(GeV/c)^2$.

13535 (BNL–52389, pp. 276-281) **Exclusive hadronic reactions at high Q^2 (90°) and polarization phenomena, an experimental proposal.** Myhrer, F. (Univ. of South Carolina, Columbia, SC (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. Grant PHYS-9006844. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Arguments are presented for the expected behaviour of $\pi N \rightarrow \pi N$ scattering and the $\bar{p}p \rightarrow \pi^-\pi^+$ reaction at high energy and large scattering angles. The annihilation reaction has close to maximal asymmetry (~ 1) for $p_{lab} \leq 2.2$ GeV/c. As will be presented for fixed (90°) angle this large asymmetry will not become zero but will start to oscillate with energy at higher energies and large Q^2 when perturbative QCD becomes applicable. This is due to the energy dependence of a phase difference between the independent quark-quark scattering (Landshoff) and short-distance processes at high but not asymptotic energies. A consequence of the existence of the Landshoff process is that even if helicity is conserved at the quark level ($m_q = 0$ MeV), helicity does not have to be conserved on the hadronic level. The authors will discuss the implications for spin observables in pp elastic scattering and argue that these QCD phenomena are easier to explore theoretically in the $\pi N \rightarrow \pi N$ scattering and/or in the crossed channel reaction $\bar{p}p \rightarrow \pi^-\pi^+$ where the analysis is simpler because these two processes have only two helicity amplitudes.

13536 (BNL–52389, pp. 311-316) **Meson spectroscopy with π and K beams.** Dzierba, A.R. (Indiana Univ., Bloomington, IN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Historically, light quark meson spectroscopy with π and K beams has played an important role in establishing the current theory of quarks and gluons. It will continue to play an important role, along with meson production in complementary reactions, in the search for the full spectrum of QCD mesons such as glueballs, exotics, hybrids, and multi-quark states, in addition to the conventional $q\bar{q}$ mesons. Current experiments and the possibilities for future facilities are discussed.

13537 (BNL–52389, pp. 349-355) **A possible experiment to study the radiative decay of excited hyperons.** Harris, P.G. (Univ. of Illinois, Urbana, IL (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. Contract NSF PHY89-21146. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

An experiment is proposed to resolve the long-standing question of the radiative width of the $\Lambda(1405)$ and of other low-lying hyperons. The proposed detector, based firmly upon those already in operation at LEAR, would have other wide-ranging spectroscopic applications. An antiproton beam of momentum ≥ 2.5 GeV/c is required.

13538 (BNL–52389, pp. 356-359) **On the spectacular large asymmetry in $\bar{p}p \rightarrow \pi^-\pi^+$ and $\bar{p}p \rightarrow K^-K^+$ reactions.** Takeuchi, S. (Univ. of South Carolina, Columbia, SC (United States)); Myhrer, F.; Kubodera, K. Brookhaven National Lab., Upton, NY (United States). [1993]. Grant PHYS-9006844. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

An illustrative analysis is presented to show the origin of the energy-independent maximal asymmetry observed for wide ranges of angles in the reactions $\bar{p}p \rightarrow \pi^-\pi^+$ and $\bar{p}p \rightarrow K^-K^+$. The general nature of the simple relation between helicity-flip and nonflip partial wave amplitudes enforces the notion that these features of the asymmetry for these two annihilation reactions are likely to persist within the hadronic regime. At higher energies these features of the asymmetry will probably be modified significantly, signaling the onset of perturbative QCD. This study supports the arguments that the final $\bar{K}K$ state originates from a more central reaction than the $\pi\pi$ final state.

13539 (BNL–52389, pp. 401-405) **Hadron spectroscopy using measurements with spin.** Svec, M. (McGill Univ., Montreal (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Measurements of $\pi N_\uparrow \rightarrow \pi^+\pi^-N$ on polarized target enable hadron spectroscopy on the level of spin amplitudes. The author finds evidence for new scalar state $I = 0^{0^{++}}$ (750) and for unexpected spin-dependent structures within ρ^0 mass region.

13540 (BNL–52389, pp. 406-411) **Evidence for exotic dibaryons.** Lomon, E.L. (Massachusetts Institute of Technology, Cambridge, MA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Recent evidence for structures in pp elastic spin observables is compared with earlier predictions based on a hybrid quark/hadron model. The detailed agreement indicates that these structures are multi-quark exotics. The implied new spectroscopy of several two-hadron systems is reviewed.

13541 (BNL–52389, pp. 412-417) **Resonance studies at the Fermilab antiproton accumulator.** Zhang, Y. (Pennsylvania State Univ., University Park, PA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The author presents the status of a study of the light meson spectroscopy at the Fermilab E760, and briefly list the upgrades for the next run.

13542 (BNL–52389, pp. 420-427) **Summary of the hadronic weak interaction session.** Bock, G. (Fermilab, Batavia, IL (United States)); Bryman, D.A.; Numao, T. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors summarize and discuss present and future experiments on decays of light mesons and muons that were presented

in the Hadronic Weak Interaction working group session of the "Workshop on Future Directions in Particle and Nuclear Physics at Multi-GeV Hadron Facilities." Precise measurements and rare-decay searches, which sense mass scales in the 1-1000 TeV region, are discussed in the context of the standard model and beyond.

13543 (BNL–52389, pp. 428-434) **Status and future plans for BNL experiment E787 ($K^+ \to \pi^+\nu\bar{\nu}$).** Frank, J.S. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The primary goal of AGS experiment E787, a collaboration of BNL, Princeton, TRIUMF, KEK, and INS/Tokyo, is to search for and ultimately measure the rare decay $K^+ \to \pi^+\nu\bar{\nu}$. This rare decay, a second order weak flavor-changing neutral process, is expected to occur with a branching ratio of $\sim 10^{-10}$. In this paper, the status of the experiment will be given and some of the upgrades to the beam line and the detector will be summarized. A conceptual design for a new experiment will also be described.

13544 (BNL–52389, pp. 435-440) **The decay $\pi^+ \to e^+\nu$.** Numao, T. (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Electron-muon universality in weak interactions has been tested at the 0.2% level by the measurements of the branching ratio of the decays $\pi^+ \to e^+\nu$ and $\pi^+ \to \mu^+\nu$. Recent theoretical calculations have suggested that the test could be further improved almost by an order of magnitude over the present level. Possible improvements in the branching ratio measurement are discussed.

13545 (BNL–52389, pp. 441-447) **Chiral symmetry and electroweak π, K, η processes.** Holstein, B.R. (Univ. of Massachusetts, Amherst, MA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Recently, the development of chiral perturbation theory has allowed the generation of rigorous low-energy theorems for various hadronic processes based only on the chiral invariance of the underlying QCD Lagrangian. Herein, the authors examine the experimental implications of chiral symmetry in the regime of electroweak Goldstone boson interactions.

13546 (BNL–52389, pp. 456-461) **$K_L \to \pi^0\nu\bar{\nu}$ using a momentum tagged K_L beam.** Konaka, A. (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A conceptual design of a possible experiment to measure the branching ratio of the direct CP violating process $K_L \to \pi^0\nu\bar{\nu}$ using a momentum tagged K_L beam is presented.

13547 (BNL–52389, pp. 462-467) **Muon polarization in K^+ decays.** Kuno, Yoshitaka (National Lab. for High Energy Physics, Ibaraki (Japan)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

K^+-decay experiments involving measurement of muon polarization are discussed. In particular, a new experiment to search for the T-violating muon polarization component in $K^+ \to \pi^0\mu^+\nu$ decay, which is in preparation at KEK, is described. The measurement is sensitive to a new CP violation mechanism beyond the Standard Model, in particular to that in extended Higgs sector. The future experimental possibility to measure the longitudinal muon polarization and the muon-spin correlations in $K^+ \to \pi^+\mu^+\mu^-$ decay is also briefly mentioned.

13548 (BNL–52389, pp. 468-479) **Rare decays of muons and kaons as a probe of new fundamental symmetries of nature.** Mohapatra, R.N. (Univ. of Maryland, College Park, MD (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The predictions for rare decays of Muons and Kaons in Left-right symmetric and general supersymmetric theories of weak interactions are discussed. It is pointed out that rare muon processes such as muonium to antimuonium conversion, $\mu^- \to e^-\nu_e\bar{\nu}_\mu$ provide sensitive tests of left-right symmetric theories if the scale of right-handed interactions is in the TeV range. Furthermore, if the neutrino spectrum of the model is of the eV:KeV:MeV type, then cosmological constraints imply a lower bound on the rates for these processes which when violated will rule out this class of models. Other rare muon decays such as $\mu \to e\gamma$ and $\mu \to 3e$ are also predicted to be in the observable range in the next generation of experiments. In the kaon sector, the muon polarization in the decays $K_L \to \mu^+\mu^-$ is also predicted to be large once CP-violation is included in these models. The author next discusses the implications of the general class of supersymmetric standard models which include R-parity violating interactions. The author finds that several rare muon processes as well as Kaon decays can occur at observable rate in these models.

13549 (BNL–52389, pp. 480-482) **Rare muon processes.** Cooper, M.D. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The status of rare muon processes as tests of the standard model is reviewed with the emphasis on results that are expected from experiments in the near future.

13550 (BNL–52389, pp. 484-490) **Summary of the eta-meson sessions.** Chrien, R.E. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract AC02-76CH00016. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This summary describes the contents of the nineteen talks related to research on the η meson and presented at the Workshop of Future Directions. The subjects of this area include threshold η production, η-nuclear spectroscopy, baryon spectroscopy, η decays, facilities, and instrumentation.

13551 (BNL–52389, pp. 491-497) **What is so special about eta physics?.** Nefkens, B.M.K. (UCLA, Los Angeles, CA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

There is no hadron quite like the eta meson. The rate for some choice semileptonic, electromagnetic and suppressed strong decays of the η is just right for testing the Standard Model and C,

CP, T, and even CPT invariance. Rare eta decays offer several new opportunities for finding a sign of New Physics.

13552 (BNL–52389, pp. 498-503) **Complementarity between electromagnetic and hadron production of the eta mesons.** Mukhopadhyay, N.C. (Rensselaer Polytechnic Institute, Troy, NY (United States)); Benmerrouche, M. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors shall compare the production of eta mesons from nucleons by electromagnetic and hadron reactions, emphasizing the lessons already learned from the former, for future works in this area at multi-GeV hadron facilities.

13553 (BNL–52389, pp. 523-528) **η and η' decay results from the GAMS-2000 spectrometer.** Alde, D.M. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The decays of η and η' have been studied using the GAMS-2000 detector at IHEP, Serpukhov. A sample of 6×10^5 η were used to measure the branching ratios for η decays into 2γ, $3\pi^o$, $\pi^o\gamma\gamma$. An upper limit was obtained for the decay $\eta \rightarrow 3\gamma$. The dependence of the matrix element for the $3\pi^o$ decay on one of the Dalitz variables was determined to be consistent with zero. A whole bunch of η' were used to measure the branching ratios into the decay channels $\eta\pi^o\pi^o$, $\omega\gamma$, 2γ, and $3\pi^o$. Upper limits were found for the decays 3γ, $\pi^o\gamma\gamma$, 3γ, $2\pi^o$, and $4\pi^o$. The dependence of the matrix elements of the decays $\eta' \rightarrow 3\pi^o$ and $\eta' \rightarrow \eta'\pi^o\pi^o$ on the Dalitz variables were obtained.

13554 (BNL–52389, pp. 535-540) **Large acceptance detector for η meson decays.** Mayer, B. (CEN, Saclay (France)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A large acceptance (3π), pure CsI detector, is discussed in the perspective of studying rare decays of the η meson, at the η tagging facility of Saturne. The discussion is focused on the $\eta \rightarrow \pi^o\gamma\gamma$ decay mode.

13555 (BONN-IR–93-58) **Studies on the determination of the Λproduction in quark and gluon jets.** Stockhausen, B. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Nov 1993. 54p. (In German). Order Number DE94747252. Source: OSTI; NTIS (US Sales Only); INIS.

Analysing Monte Carlo data a method has been developed to study the distribution of Λbaryons in three-jet hadronic Z^0 events. The jets are defined using the DURHAM jet finder. After identifying quark and gluon jets by energy ordering Monte Carlo data is studied to determine the jet purities. The aim of this approach is to avoid a substantial loss of events due to hard quality cuts since a large sample of three-jet events is essential to study the Λinclusive spectra inside the different types of jets. Therefore a lower jet purity has to be accepted. It is found that Λ-multiplicities can be derived reliably from jets of different energy and purity. With the JETSET Monte Carlo a Λ-rate was found to be larger in gluon jets than in quark jets. Comparing the Λ-rates in gluon jets from OPAL-data and JETSET events the yield in the experimental data seems to be even larger. (orig.)

13556 (BUDKERINP–92-46) **Determination of the Υ(1s) leptonic width.** Baru, S.E. (and others); Blinov, A.E.; Blinov, V.E. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 23p. Order Number DE94618534. Source: OSTI; NTIS (US Sales Only); INIS.

The data recorded with the MD-1 detector operated at the VEPP-4 storage ring were analyzed and the Υ(1s) resonance leptonic partial width and mass are determined. Γ_{ee}=1.29+-0.03+-0.03 keV, M=9460.59+-0.09+-0.05 MeV/c^2 are find. Thies new value of the Υ(1s) nass should superside the previously published value. 26 refs.; 6 figs.; 1 tab.

13557 (BUDKERINP–92-55) **T-odd, P-even photon-fermion interactions.** Khriplovich, I.B. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 8p. Order Number DE94616869. Source: OSTI; NTIS (US Sales Only); INIS.

General structure of T-odd, P-even photon-fermion scattering amplitude is discussed. The corresponding operators are of high dimension. Therefore the experimental data on the high-energy cross sections bound the effective constants so strictly that the possible manifestations of these interactions in the low-energy region are extremely small. 8 refs.

13558 (BUDKERINP–92-80) **Sum rules for 1/m corrections to the form factors of semileptonic B decays.** Bajer, V.N.; Grozin, A.G. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 16p. Order Number DE94618548. Source: OSTI; NTIS (US Sales Only); INIS.

Semileptonic B decays are described by the Isgur-Wise form factor to the leading order in 1/m; four new functions appear in the firsat order. Values of these functions are crucial for the applicability of the whole approach to processes involving c quark. The sum rules for three subleading $B \rightarrow D^{(*)}$ form factors from the QCD sum rules with finite masses by explanding to the first order in 1/m are obtained. The results respect the pattern of the first 1/m corrections established in heavy quark effective theory, and obey the Luke theorem. 26 refs.; 3 figs.

13559 (CEA-LNS-Ph–91-32) **Measurement of spin transfer parameters in the p-barp→n-barn charge-exchange reaction at LEAR.** Arvieux, J. (Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Agnello, M.; Ahmidouch, A.; Lamanna, M. PS199 Collaboration. Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 1991. 7p. (CONF-9103165–: International conference on spin and isospin in nuclear interactions, Telluride, CO (United States), 11-15 Mar 1991). Order Number DE94618539. Source: OSTI; NTIS (US Sales Only); INIS.

The experiment PS199 at LEAR investigates the spin structure of the charge-exchange reaction p-barp→n-barn. Data for the measurement of the spin transfer parameters for both neutron and antineutron were collected during 1990 and preliminary results are presented. (author) 6 refs.; 4 figs.

13560 (CEA-LNS-Ph–91-33) **Measurement of the depolarization parameter and the spin transfer parameter in the charge-exchange reaction p-barp→n-barn at LEAR.** Arvieux, J. (Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Torre-Colautti, S.D.; Macciotta, M.P.; Niinikoski, T. PS199 Collaboration. Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 1991. 13p. (CONF-9107247–: Workshop on Nucleon-Antinucleon Interactions. NAN-91, Moscow (Russian Federation), 8-11 Jul 1991). Order Number DE94618540. Source: OSTI; NTIS (US Sales Only); INIS.

Experiment PS199 at LEAR studies the charge-exchange p-barp→n-barn reaction and, in particular, its spin structure. Data for the measurement of the depolarization parameter for polarized target (D_{0n0n}) and the polarization transfer parameter from the target to the scattered particle (K_{0n0n}) have been collected during 1990. The determination of these parameters requires n- and n-barpolarimetry. Polarimeters are described and their performances are given. (author) 10 refs.; 7 figs.

13561 (CEA-LNS-Ph–91-35) **Strangeness production in pN and pA scattering.** Bertini, R. Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 1991. 13p. (CONF-9111167–: Workshop on hyperon and hypernuclear physics with proton beams, Bloomington, IN (United States), 8-10 Nov 1991). Order Number DE94618541. Source: OSTI; NTIS (US Sales Only); INIS.

In the perspective of a new machine with energies of 15 to 30 GeV, providing a cooled proton beam with low emittance and momentum dispersion, some experimental techniques are discussed. Three possibilities considered are: either a classical extracted beam with an external target, or an internal beam with an internal target, or a collider. The availability of a polarised beam and/or of a polarised target is also assumed. The following topics are discussed: hyperon polarisation, the hyperon-nucleon interaction, the spectroscopy of the Y* resonances, and hyperons and Y* resonances in nuclear matter. (K.A.) 27 refs.; 4 figs.

13562 (CONF-940161–1) **Prospects for studies of ground-state proton decays with the Holifield Radioactive Ion Beam Facility.** Toth, K.S. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 17. nuclear physics symposium; Oaxtepec (Mexico); 3-7 Jan 1994. Order Number DE94006558. Source: OSTI; NTIS; INIS; GPO Dep.

By using radioactive ions from the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory it should be possible to identify many new ground-state proton emitters in the mass region from Sn to Pb. During this production and search process the limits of stability on the proton-rich side of the nuclidic chart will be delineated for a significant fraction of medium-weight elements and our understanding of the proton-emission process will be expanded and improved.

13563 (CRN-HE–90-02) **Comparison of final states from e^+e^-, lN, lA, pp, pA and AA' collisions.** Geist, W.M. Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires. 1990. 29p. (CONF-9009315–: 20. international symposium on multiparticle dynamics, Gut Holmecke (Germany), 10-14 Sep 1990). Order Number DE94618527. Source: OSTI; NTIS (US Sales Only); INIS.

Phase space densities of hadrons from all high energy reactions, mainly in the energy range $\sqrt{s}\simeq$10-60 GeV, are compared. They represent the final states in the evolution of color-neutral parton systems. Nuclear targets may provide a handle on earlier phases of the hadronization processes. In heavy ion collisions at high energies one tries to study hadronization via a phase transition to a Quark-Gluon Plasma. For a good understanding of the nonperturbative hadronization process detailed investigations of all high energy interactions seem to be required. (author) 39 refs.; 26 figs.

13564 (DESY–92-169) **Heavy-quark production in two-photon collisions.** Drees, M. (Wisconsin Univ., Madison (United States). Dept. of Physics); Kraemer, M.; Zunft, J.; Zerwas, P.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1992. 14p. Order Number DE94752380. Source: OSTI; NTIS (US Sales Only); INIS.

Heavy quarks are copiously produced in two-photon collisions at e^+ e^- colliders. We present the inclusive production rates and the final state distributions of the quarks, including QCD radiative corrections for the leading subprocesses. The results are compared with recent measurements of charmed particle production at PETRA and PEP, and predictions are given for TRISTAN and LEP energies. (orig.)

13565 (DESY–92-170) **Two-photon decay widths of Higgs particles.** Djouadi, A. (Montreal Univ., Quebec (Canada). Lab. de Physique Nucleaire); Spira, M.; Zerwas, P.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1992. 13p. (UdeM-LPN-TH–111). Order Number DE94752469. Source: OSTI; NTIS (US Sales Only); INIS.

Two-photon decays of Higgs bosons are important channels for the search of these particles in the intermediate mass range at the pp colliders LHC and SSC. Dynamical aspects of the Higgs coupling to two photons can also be studied by means of the $\gamma\gamma$ fusion of Higgs particles at high-energy e^+e^- linear colliders. Extending earlier analyses which had been restricted to the Standard Model, we present in this note the QCD radiative corrections to the $\gamma\gamma$ decay widths of scalar and pseudoscalar Higgs particles in multi-doublet extensions of the Higgs sector, as realized for instance in supersymmetric theories. (orig.). 3 figs.

13566 (DESY–93-010) **Single jet photoproduction at HERA in next-to-leading order QCD.** Kramer, G. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Salesch, S.G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jan 1993. 25p. Foerderkennzeichen BMFT 055HH91P. Order Number DE94752381. Source: OSTI; NTIS (US Sales Only); INIS.

We present results for next- to-leading order calculations of single jet inclusive cross sections by resolved photons in ep-collisions at HERA. The dependence on the jet recombination cut and on the choice of the renormalization and factorization scales is studied in detail. (orig.). 5 figs.

13567 (DESY–93-011) **Infinite momentum frame calculation of semileptonic heavy $\Lambda_b \to \Lambda_c$ transitions including HQET improvements.** Koenig, B. (Mainz Univ. (Germany). Inst. fuer Physik); Koerner, J.G.; Kraemer, M.; Kroll, P. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 26p. Foerderkennzeichen BMFT 06MZ730; Foerderkennzeichen BMFT 06WU765 Order Number DE94752382. Source: OSTI; NTIS (US Sales Only); INIS.

We calculate the transition form factors that occur in heavy Λ-type baryon semileptonic decays as e.g. in $\Lambda_b \to \Lambda^+_c + l^- +$ anti ν_l. We use Bauer-Stech- Wirbel type infinite momentum frame wave functions for the heavy Λ-type baryons which we assume to consist of a heavy quark and a light spin-isospin zero diquark system. The form factors at $q^2 = 0$ are calculated from the overlap integrals of the initial and final Λ-type baryon states. To leading order in the heavy mass scale the structure of the form factors agrees with the HQET predictions including the normalization at zero recoil. The leading order ω-dependence of the form factors is extracted by scaling arguments. By comparing the model form factors with the HQET predictions at $O(1/m_Q)$ we obtain a consistent set of model form factors up to $O(1/m_Q)$. We use our form factor predictions to compute rates, spectra and various asymmetry parameters for the semleptonic decay $\Lambda_b \to \Lambda^+_c + l^- +$ anti ν_l. (orig.). 4 figs.

13568 (DESY–93-019) **Diffractive W and Z production at p anti p colliders and the pomeron parton content.** Bruni, P. (Istituto Nazionale di Fisica Nucleare, Bologna (Italy)); Ingelman, G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 10p. Order Number DE94752388. Source: OSTI; NTIS (US Sales Only); INIS.

High-p perpendicular to jets in diffractive p anti p events have revealed a parton structure in the exchanged pomeron. Based in a model using a pomeron structure function dominated by either quarks or gluons we calculate diffractive W/Z production and find observably large cross-sections at the Tevatron energy. The relative quark and gluon content may here be experimentally investigated and the x-shape of their density functions obtained to give new insights on the nature of the pomeron. (orig.)

13569 (DESY–93-027) **A note on the BFKL Pomeron and the 'Hot Spot' cross section.** Bartels, J. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Lotter, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Mar 1993. 22p. Order Number DE94752375. Source: OSTI; NTIS (US Sales Only); INIS.

We comment on the numerical calculation of the Lipatov Pomeron in the measurement of 'Hot Spots' in deep inelastic scattering. We illustrate that previous analytic estimates based upon the leading term in the Lipatov equation are accurate within 20%. We present evidence that numerical calculations should be done with a fixed α_s. The use of a running α_s appears as an unnecessary complication. We argue that at low Q^2 the BFKL Pomeron requires higher order corrections. (orig.)

13570 (DESY–93-048) **Double J/ψproduction: a probe of gluon polarization?.** Baranov, S.P. (AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.); Jung, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). May 1993. 15p. Order Number DE94752466. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the process of direct simultaneous production of two J/ψ particles and discuss the possibility that it can be used as a tool to measure the gluon polarization in the colliding particles. (orig.)

13571 (DESY–93-071) **What HERA tells us about the photon.** Bussey, P.J. (Glasgow Univ. (United Kingdom). Dept. of Physics and Astronomy). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 15p. (CONF-930319–: International conference on nuclear and particle physics, Glasgow (United Kingdom), 30 Mar - 1 apr 1993). Order Number DE94752464. Source: OSTI; NTIS (US Sales Only); INIS.

An account is given of photon physics at HERA. The basic physical processes are described, some theoretical models are outlined, and it is shown how measurements at HERA have already helped to confirm our basic understanding of the hadronic nature of the photon. (orig.)

13572 (DESY–93-079) **Theoretical predictions for W-pair production.** Beenakker, W. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Gruppe Theorie); Denner, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 7p. (CONF-9304229–: 2. international workshop on physics and experiments at linear e^+e^- colliders; European workshop at DESY, Waikoloa, HI (United States), 26 Apr - 3 may 1993; CERN-TH–6928/93). Order Number DE94752404. Source: OSTI; NTIS (US Sales Only); INIS.

We review the status of theoretical predictions for W-pair production at high energies. We discuss a systematic scenario towards a Monte-Carlo generator for $e^+e^-\rightarrow 4f(\gamma)$, which meets the experimental requirements. In particular we summarize the recent developments in this field. (orig.)

13573 (DESY–93-081) **Absorptive corrections to structure functions at small-x.** Bartels, J. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Ryskin, M.G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1993. 17p. Order Number DE94752405. Source: OSTI; NTIS (US Sales Only); INIS.

The role of corrections due to the interactions between different branches of parton (gluon) cascades is studied. It is shown that at HERA energies these interactions increase the absorptive (two-Pomeron cut) contributions by about 60 to 80 percent compared with the Gribov-Levin-Ryskin equation. (orig.)

13574 (DESY–93-088) **Theoretical problems of Higgs-boson physics at the next linear collider.** Kniehl, B.A. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 9p. (CONF-9304229–: 2. international workshop on physics and experiments at linear e^+e^- colliders; European workshop at DESY, Waikoloa, HI (United States), 26 Apr - 3 may 1993). Order Number DE94752406. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss some theoretical aspects of standard-model (SM) Higgs-boson (H) phenomenology at the next e^+e^- linear collider (NLC) with 300 GeV< or $\approx\sqrt{s}<$ or $\approx$500 GeV. The topics include radiative corrections to H production and decay; the study of the major signals and backgrounds including acceptance cuts, bremsstrahlung, and beamstrahlung; the determination of mass, spin, parity, and charge conjugation of H; and the H discovery limit at $\sqrt{s}$=500 GeV. (orig.)

13575 (DESY–93-089) **Complete tree-level calculation of the reaction $e^+e^-\rightarrow\mu^+\mu^-$b anti b and the Higgs boson signal at LEP200 and NLC energies.** Boos, E. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Sachwitz, M.; Schreiber, H.J.; Shichanin, S. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Jul 1993. 19p. Order Number DE94752395. Source: OSTI; NTIS (US Sales Only); INIS.

A complete tree-level calculation of the reaction $e^+e^-\rightarrow\mu^+\mu^-$b anti b in the electroweak standard theory for the energy range of LEP200 and the Next Linear Collider is presented. The matrix elements have been calculated by employing the computer program CompHEP, the phase space integrals by the Monte Carlo integrator and event generator BASES/SPRING. The dependence of the 4-fermion cross section on energy, Higgs boson mass and Higgs width is studied in detail. Interference contributions between the various diagrams are found not to alter significantly the production and decay distributions of the Higgs boson. It is shown that already the counting rate of the reaction $e^+e^-\rightarrow\mu^+\mu^-$b anti b at LEP200 can provide evidence for the existence of the Higgs boson. The dependence of the $\mu^+\mu^-$b anti b cross section on the Higgs width will allow to extract information on this width in particular at LEP200 energies. (orig.)

13576 (DESY–93-090) **The decay b $\rightarrow$sγ in the MSSM revisited.** Borzumati, F.M. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Aug 1993. 45p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 055HH91P. (HEP-PH–9310212). Order Number DE94751735. Source: OSTI; NTIS (US Sales Only); INIS.

We present a re-analysis of the decay $b\rightarrow s\gamma$ in the Minimal Supersymmetric Standard Model with radiatively induced breaking of the gauge group SU(2)xU(1). We extend this analysis to regions of the supersymmetric parameter space wider than those previously studied. Results are explicitly presented for m_t=150 GeV. We emphasize the consequences for future searches of charged Higgs and charginos from a measurement of this decay at the Standard Model level. In spite of the strong sensitivity of this decay to the effects of supersymmetry, we find that, at the moment, no lower limit on the mass of these particles can be obtained. The large chargino contributions to the branching ratio for $b\rightarrow s\gamma$, for large values of tan β, are effectively reduced by pushing the lightest eigenvalue of the up-squark mass matrix closer to the electroweak scale, i.e. by increasing the degree of degeneracy among the up-squarks. (orig.)

13577 (DESY–93-095) **The longitudinal structure function $F_L(x,Q^2)$ at small x.** Bluemlein, J. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Jul 1993. 8p. (CONF-9303228–: Workshop on HERA: the new frontier for QCD, Durham (United Kingdom), 21-26 Mar 1993). Order Number DE94752401. Source: OSTI; NTIS (US Sales Only); INIS.

The gluon contributions to the structure function $F_L(x, Q^2)$ is calculated using $k_\perp$-factorization. A generalization of this factorization is given which allows the expression of structure functions and hard cross sections in terms of quantities being well defined within perturbative QCD. (orig.)

13578 (DESY–93-097) **On the measurement of the proton structure at small Q^2.** Bluemlein, J. (Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik); Levman, G.; Spiesberger, H. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Jul 1993. 15p. (CONF-9303228–: Workshop on HERA: the new frontier for QCD, Durham (United Kingdom), 21-26 Mar 1993). Order Number DE94752403. Source: OSTI; NTIS (US Sales Only); INIS.

Large angle radiative scattering at HERA, $ep\rightarrow e\gamma X$, can be used for a measurement of the low Q^2 behaviour of proton structure functions. The measurement can be interpreted as probing the photon density of the proton through virtual Compton scattering. (orig.)

13579 (DESY–93-102) **Implications of radiative corrections for the supersymmetric Higgs search at the NLC.** Hempfling, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 6p. (CONF-9304229–: 2. international workshop on physics and experiments at linear e^+e^- colliders; European workshop at DESY, Waikoloa, HI (United States), 26 Apr - 3 may 1993). Order Number DE94752402. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the importance of radiative corrections for the Higgs boson phenomenology of the minimal supersymmetric model. The Higgs discovery potential of the next e^+e^- linear collider (NLC) with 300 GeV< or $\approx\sqrt{s}<$ or $\approx$500 GeV is presented. We pay particular attention to the possibility of disentangling the MSSM from the standard model (SM). (orig.)

13580 (DESY–93-106) **Calculation of jetshapes in γpcollisions at HERA.** Kramer, G. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Salesch, S.G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1993. 12p. Order Number DE94752398. Source: OSTI; NTIS (US Sales Only); INIS.

We have calculated jet shapes in resolved γp collisions in pertubation theory at order α_s^3 for the hard parton-parton processes. Various predictions concerning the dependence on transverse energy, rapidity and the inner cone extension are presented. (orig.)

13581 (DESY–93-129) **Weak and superweak processes at HERA.** Buchmueller, W. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 37p. (CONF-9305329–: 21. international meeting on fundamental physics, Madrid (Spain), 9-15 May 1993). Order Number DE94752156. Source: OSTI; NTIS (US Sales Only); INIS.

Physics beyond the standard model could be revealed through new short range interactions, induced by the exchange of new particles which are too heavy to be produced directly. The flavour structure and the strength of such contact interactions would then allow to draw conclusions on the dynamics and the mass scale of the new physics. Of course, one can also directly produce new heavy particles in electron-quark scattering. Depending on the quantum numbersrs, some particles are more effectively produced in ep-scattering than in e^+e^--or p anti p-annihilation. In the following chapters we discuss these topics in turn. We first describe the different electroweak processes, i.e., neutral and charged current inelastic scattering and the production of vector bosons. This leads us to a discussion of electroweak precision tests, followed by a review of contact interactions. There is a variety of new particles which can be produced in high-energy electron-proton scattering. In some detail we consider the production of super-particles, leptoquarks and heavy neutrinos. (orig.)

13582 (DESY–93-131) **New perturbative upper bound on M_H from fermionic Higgs decays at two loops.** Durand, L. (Wisconsin Univ., Madison (United States). Dept. of Physics); Kniehl, B.A.; Riesselmann, K. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 14p. (MAD/TH–93-07). Order Number DE94752172. Source: OSTI; NTIS (US Sales Only); INIS.

We present the dominant two-loop O ($G_F^2 M_H^4$) electroweak corrections to the fermionic decay widths of a high-mass Higgs boson in the Standard Model. The corrections are negative and quite significant, and are larger in magnitude than the one-loop electroweak corrections for $M_H >$ or $\approx$400 GeV. This indicates the onset of a breakdown of perturbation theory in the Higgs sector of the Standard Model at this surprisingly low value of the Higgs boson mass. (orig.)

13583 (DESY–93-135) **On the determination of the b $\rightarrow$c handedness using nonleptonic Λ_c-decays.** Koenig, B. (Mainz Univ. (Germany). Inst. fuer Physik); Koerner, J.G.; Kraemer, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Sep 1993. 16p. Order Number DE94752170. Source: OSTI; NTIS (US Sales Only); INIS.

We consider possibilities to determine the handedness of b$\rightarrow$c current transitions using semileptonic baryonic $\Lambda_b \rightarrow \Lambda_c$ transitions. We propose to analyze the longitudinal polarization of the daughter baryon Λ_c by using momentum-spin correlation measurements in the form of forward-backward (FB) asymmetry measures involving its nonleptonic decay products. We use an explicit form factor model to determine the longitudinal polarization of the Λ_c in the semileptonic decay $\Lambda_b \rightarrow \Lambda_c + l^- +$ anti ν_l. The mean longitudinal polarization of the Λ_c is negative (positive) for left-chiral (right-chiral) b$\rightarrow$c current transitions. The frame dependent longitudinal polarization of the Λ_c is large ($\simeq$80%) in the Λ_b rest frame and somewhat smaller (30%-40%) in the lab frame when the Λ_b's are produced on the Z_0 peak. We suggest to use nonleptonic decay modes of the D_c to analyze its polarization and thereby to determine the chirality of the b$\rightarrow$c transition. Since the Λ_b's produced on the Z_0 are expected to be polarized we discuss issues of the polarization transfer in $\Lambda_b \rightarrow \Lambda_c$ transitions. We also investigate the $p_\perp$- and p-cut sensitivity of our predictions for the polarization of the Λ_c. (orig.)

13584 (DESY–93-138) **Higgs production in pp collisions: QCD corrections.** Spira, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Oct 1993. 6p. (CONF-9305311–: 16. Kazimierz meeting on elementary particle physics: new physics with new experiments, Kazimierz (Poland), 24-28 May 1993). Order Number DE94752155. Source: OSTI; NTIS (US Sales Only); INIS.

Gluon fusion is the main production mechanism of Higgs bosons at the LHC and SSC for Higgs masses below $\approx$700 GeV. The coupling of the Higgs to two gluons is built-up by quark-loops with heavy quarks giving the dominant contribution. The two loop QCD corrections to this process will be presented for arbitrary Higgs and top masses. This study includes the production of the Standard Model Higgs boson as well as of the neutral CP-even and -odd SUSY-Higgs particles. We find large corrections which cannot be neglected in experimental analyses of this production mechanism. (orig.)

13585 (DESY–93-153) **Radiative corrections to leptoquark pair production in e^+e^- annihilation.** Bluemlein, J. Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik. Oct 1993. 17p. (CONF-930005–: Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider, Munich (Germany); Annecy (France); Hamburg (Germany), 1993; 1993; 1993; CONF-930006–; CONF-930007–). Order Number DE94751947. Source: OSTI; NTIS (US Sales Only); INIS.

QED and QCD radiative corrections are calculated for the pair production cross sections of leptoquarks in e^+e^- annihilation. Large corrections are found for the production process near threshold. For β=0.1 the QED corrections are of OMIKRON (-40% to -50%). QCD corrections may reach OMIKRON (+100%). (orig.)

13586 (DOE/ER/40736–1) **Elementary particle physics: Progress report, July 1993–January 1994.** Izen, J.M. Texas Univ., Richardson, TX (United States). Dept. of Physics. Jan 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-92ER40736. Order Number DE94006071. Source: OSTI; NTIS; INIS; GPO Dep.

Much of the work was connected with experimental measurements made at the Beijing Spectrometer operating at $\sqrt{s}$ = 4.03 GeV. The effort has now moved to investigating the physics derived from the $\sqrt{s}$ = 4.03 GeV data, including D_s production, absolute D_s branching fractions (hadronic, leptonic, and inclusive semileptonic), D^*D and D^*D^* production, absolute D hadronic branching fractions, D^* branching fractions, and an upper limit on the ν_τ mass. 2 figs., 11 refs.

13587 (DOE/FTR–94003593) **Travel to Japan to participate in 9th Topical Workshop on Proton- Antiproton Collider Physics: Foreign trip report, October 15, 1993–October 25, 1993.** Albrow, M.G. Fermi National Accelerator Lab., Batavia, IL (United States). 5 Nov 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE94003593. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Workshop provided an opportunity for a complete overview of physics at the Tevatron, including W and Z production and decay, heavy quark (c and b) properties, QCD studies, and searches for new particles, in particular the top quark. There were also reports from the CERN pbar-p collider and from HERA, LEP and TRISTAN. Univ. of Tsukuba work on the CDF Plug Upgrade and miniature scintillating fiber hodoscopes is briefly described.

13588 (FNAL/C–93/207-E) **The ratio of CDF low E_t jet cross-sections at $\sqrt{s}$ = 546 and 1,800 GeV.** CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930823–20: 16. international symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94006847. Source: OSTI; NTIS; INIS; GPO Dep.

Inclusive jet cross-sections have been measured in $\bar{p}p$ collisions at $\sqrt{s}$ = 546 and 1,800 GeV, using the CDF detector at the Fermilab Tevatron. The ratio of low E_t (25–75 GeV) jet cross sections vs. E_t has been formed, and the authors have used this as a tool to investigate some implications of the published 1989 CDF "jet scaling" results. In particular, results at 1,800 GeV have given no indication of any unsuspected errors in CDF's low E_t jet measurements.

13589 (FNAL/C–93/210-E) **Measurement of the ratio R = $\sigma \times$ B($p\bar{p} \rightarrow W^\pm \rightarrow e^\pm\nu$)/$\sigma \times$ B($p\bar{p} \rightarrow Z^0 \rightarrow e^+e^-$) in $p\bar{p}$ collisions at $\sqrt{s}$ = 1,800 GeV.** CDF Collaboration. Fermi National

Accelerator Lab., Batavia, IL (United States). Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-930823–21: 16. international symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94006846. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present preliminary results on the measurement of the ratio of W and Z cross sections in $p\bar{p}$ collisions at $\sqrt{s}$ = 1,800 GeV in the electron decay channel. The data represent approximately 18.4 pb^{-1} from the 1992–1993 run of the Collider Detector at Fermilab. They find R = 10.64 ± 0.36 (stat.) ± 0.27 (sys.). From this value they extract a value for the ratio of W and Z total decay widths, $\Gamma(W)/\Gamma(Z)$, and set a model-independent limit on the top quark mass m_{top}.

13590 (FNAL/C–93/359-E) **Multiplicity distributions in $\bar{p}p$ interactions at $\sqrt{s}$ = 1800 GeV.** Rimondi, F. (University of Bologna and INFN Bologna (Italy)). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Nov 1993. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9309297–6: 23. international symposium on multiparticle dynamics, Aspen, CO (United States), 13-17 Sep 1993). Order Number DE94007392. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results on multiplicity distributions at $\sqrt{s}$ = 1800 GeV in the η intervals $|\eta| \leq 2.5, 2.0, 1.5, 1.0, 0.5$ are presented. The data were collected with a minimum bias trigger by the Collider Detector at Fermilab in two different runs. A small sample of data at $\sqrt{s}$ = 630 GeV was used for comparison with lower energy results and for checking on systematic effects. The multiplicity distributions at $\sqrt{s}$ = 1800 GeV deviate from the negative binomial distribution in rapidity intervals larger than $|\eta| \geq 0.5$. This confirms the trend already observed at $\sqrt{s}$ = 900 GeV where the deviation from the negative binomial starts at $|\eta| > 2.5$.

13591 (FNAL/C–93/362-E) **b production at CDF.** Crane, D.A. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–13: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94006848. Source: OSTI; NTIS; INIS; GPO Dep.

The production of b quarks in $p\bar{p}$ collisions is studied in the Collider Detector at Fermilab (CDF), using the B meson decay channels $B^+ \rightarrow J/\psi K^+$ and $B^0 \rightarrow J/\psi K^{*0}$, with $J/\psi \rightarrow \mu^+\mu^-$ and $K^{*0} \rightarrow K^+\pi^-$, and their charge conjugates. Measurements of the B meson and b quark cross-sections integrated above minimum transverse momentum values in the rapidity range $|y| < 1$ are described. The first fully differential B meson cross-section measurement, in the same rapidity range, is also reported. Comparison is made to the $O(\alpha_s^3)$ theoretical calculations.

13592 (FNAL/C–93/388-E) **A search for rapidity gaps in jet events and a study of color coherence in multijet events at D0.** Borcherding, F. D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–12: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94006849. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present studies of Rapidity Gaps and Color Coherence in jet events at the DO Detector for data taken during the recent Tevatron collider run at $\sqrt{s}$ = 1.8 TeV. An upper limit of $f(\Delta\eta_c > 3) < 1.2 \times 10^{-2}$ @ 95% C.L. on the true rapidity gap fraction is given. The color coherence results indicate the angle ordering approximation as modeled in the Herwig Monte Carlo represents the collider as well.

13593 (FNAL/C–93/403-E) **Hyperon weak radiative decays and magnetic moments.** Cooper, P.S. E761 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). 23 Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States);AN SSSR, Moscow (Russian Federation). DOE Contract AC02-76CH03000 ; AC02-80ER10587 ; AC02-76ER03075 ; FG02-91ER40664 ; FG02-91ER40682 ; FG02-91ER40631. (CONF-9310259–5: U.S./Japan seminar on hyperon-nucleon interactions, Maui, HI (United States), 24-28 Oct 1993). Order Number DE94008222. Source: OSTI; NTIS; INIS; GPO Dep.

We have measured the branching ratio and asymmetry parameter in the hyperon radiative decays $\Sigma^+ \rightarrow p\gamma$ and $\Xi^- \rightarrow \Sigma^-\gamma$ with samples of 34754±212 and 211±33 events respectively decay $\Omega^- \rightarrow \Xi^-\gamma$ and made a precision measurement of the magnetic moments of the Σ^+ and a first measurement of the magnetic moment of the anti(Σ^+). These results and the techniques used in these measurements are discussed.

13594 (FNAL/C–94/016-E) **Study of associated gauge boson production at D0: W_γ production.** Spadafora, A.L. (Superconducting Super Collider Lab., Dallas, TX (United States)). The D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–14: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94006951. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results are presented from a study of $\bar{p}p \rightarrow W\gamma + X$ at $\sqrt{s}$ = 1800 GeV at D0 using data from its recently completed first run at the Fermilab Tevatron Collider. The analysis is performed in both the electron and muon channels. In each channel 10 events are observed, which, after subtracting backgrounds, agrees with the Standard Model expectation. Study of this process is a direct test of the couplings of the $WW\gamma$ vertex. Using a Monte Carlo calculation of the dependence of the number of expected events on these couplings, we set preliminary limits (at the 95% confidence level) on the anomalous couplings of $-2.5 \leq \Delta\kappa \leq 2.7$ (γ = 0) and $-1.2 \leq \lambda \leq 1.1$ ($\Delta\kappa$ = 0).

13595 (FNAL/C–94/017-E) **Lepton charge asymmetry from W decay and search for new gauge bosons at D0.** Taketani, Atsushi. D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–15: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94006952. Source: OSTI; NTIS; INIS; GPO Dep.

A measurement is described of the charge asymmetry in the pseudorapidity distribution of muons from W boson decay in proton- antiproton collisions at $\sqrt{s}$ = 1.8 TeV using the D0 detector. We also report on a search for extra gauge bosons in the electron decay channel. Mass limits of $M_{W'} > 600$ GeV and $M_{Z'} > 440$ GeV are obtained at 95% confidence level under the assumption of standard model couplings.

13596 (FNAL/C–94/035-E) **Studies of jet production with the DO detector.** Weerts, H. (Michigan State Univ., East Lansing, MI (United States). Dept. of Physics and Astronomy). D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–21: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94008271. Source: OSTI; NTIS; INIS; GPO Dep.

During the first collider run at the Tevatron, the DO experiment has accumulated a large sample of events with jet final states, covering a jet E_T range from about 30 to 400 GeV and pseudorapidities up to η = 3.2. First results about the transverse energy flow as a function of the jet cone size R are obtained and presented. The study of the two leading E_T jets in events results in a measurement of the dijet angular distribution $1/\sigma d\sigma/d\chi$ as well as the triple differential cross section $d^3\sigma/dE_T d\eta_1 d\eta_2$ over a rapidity region not explored before. The correlation between E_T of two jets and their distance in pseudorapidity is outlined as a test of resummation techniques and compared to a recent theoretical prediction. Finally distributions are presented characterizing the topology of 3 jet events and they are compared to parton shower Monte Carlo's and to an $O(\alpha_s^3)$ prediction at the tree level.

13597 (INIS-mf–13780, pp. 47-48) **Bose-Einstein particles correlation using e^+ e^- interactions at A M Y detector of Japan.** Zomoorodian, M.A. (Ferdowowsi Univ., Meshad (Iran, Islamic Republic of) Faculty of Science). Iranian Physics Society,

Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRON-POSITRON INTERACTIONS; BOSONS; EXPERIMENTAL DATA; PION CONDENSATION; PIONS; SPACE-TIME

13598 (INIS-mf–13780, pp. 48) **High twist contribution to large-p dilepton production.** Aghaiev, Sh. (Baku Univ., (Azerbaijan)). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LEPTONS/pair production; LEPTONS/spin; FEYNMAN DIAGRAM; LEPTONS; SPIN; MOMENTUM TRANSFER; PHASE SPACE; WAVE FUNCTIONS

13599 (INP–1596/PH) **Sigma minus-nucleus interactions in emulsion at 350 GeV.** Szarska, M. (Institute of Nuclear Physics, Cracow (Poland)); Wilczynski, H.; Wolter, W.; Wozniak, K.; Lord, J.J.; Wilkes, R.J. Institute of Nuclear Physics, Cracow (Poland). May 1992. 21p. Order Number DE94616886. Source: OSTI; NTIS (US Sales Only); INIS.

Experimental data on multiplicities and angular distributions of heavy ionizing and shower particles in inelastic interactions of 350 GeV Σ^- hyperon with emulsion nuclei were investigated. The data were compared with the results of other experiments on proton and pion interactions in emulsion at energies within the interval 60-800 GeV. 14 figs., 29 refs. (author).

13600 (INP–1608/PH) **J/ψ absorption effects in the coherent production on nuclei.** Lesniak, L. Institute of Nuclear Physics, Cracow (Poland). Dec 1992. 10p. Grant 201989101. Order Number DE94616870. Source: OSTI; NTIS (US Sales Only); INIS.

J/ψ coherent production and attenuation on nuclei by high energy muons and photons is studied. A simple one parameter model leads to a good description of the New Muon Collaboration and Fermilab data. It is found that the effective absorption cross section of the cc-bar pair on a target nucleon is about 6 mb. 2 figs., 32 refs. (author).

13601 (IPNO-DRE–93-09) **GRAAL.** GRAAL Collaboration. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 75p. Order Number DE94618535. Source: OSTI; NTIS (US Sales Only); INIS.

The GRAAL collaboration aims at the realization of a polarized and tagged γ-ray beam at the Electron Storage Ring Facility (ESRF) in Grenoble and its use for the study of photoreactions in the energy range 300-1800 MeV, with a 4π detector including the INFN BGO-ball as calorimeter, wire chambers as vertex detector and a plastic wall. The detector, the GRAAL beam and the monitors are described in detail. The physics to be studied include strangeness photoproduction, η and η' production and rare π^0 decays. Monte-Carlo simulations at these experiments are also described. (K.A.) 75 refs.; 35 figs.; 4 tabs.

13602 (ITP–93-14E) **P-matrix approach and three-nucleon problem.** Babenko, V.A.; Petrov, N.M.; Teneva, G.N. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 8p. Order Number DE94616887. Source: OSTI; NTIS (US Sales Only); INIS.

The paper deals with the P-matrix approach application to the three strongly interacting particles systems description. On the basis of the obtained off-energy-shell scattering amplitude separable expansion in the P-matrix approach the low-energy three-particle quantities were calculated in the case of square-well potential. The results of calculations show good convergence of the calculated three-particle quantities. (author). 12 refs., 1 tab.

13603 (ITP–93-25E) **Alternating series fit to the total cross sections.** Il'in, Yu.; Lendel, A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. Order Number DE94616888. Source: OSTI; NTIS (US Sales Only); INIS.

It is show by a simple Regge-type fit suggested recently by Donnachie and Landshoff that the universal pomeron contribution to various total cross sections may be represented by an alternating series a - b log s + c (log s)^2 corresponding to a series of Regge multipoles. (author). 9 refs., 5 tabs., 5 figs.

13604 (ITP–93-31E) **Notes on possible S-wave resonances in relativistic two-particle systems.** Shapoval, D.V.; Simenog, I.V.; Sitenko, O.G. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 8p. Order Number DE94616889. Source: OSTI; NTIS (US Sales Only); INIS.

Some models of relativistic two-particle systems are examined for possible irregularities in the S-wave continuous spectrum. None are found, though we show that with singular effective interaction potentials it is quite easy to run into artificial resonances originating from inaccurate calculations. (author). 11 refs., 3 figs.

13605 (IYaF–91-91) **Project of the experiment on mass measurement of τ lepton at VEPP-4M.** Bondar', A.E.; Purlats, T.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1991. 21p. (In Russian). Order Number DE94618536. Source: OSTI; NTIS (US Sales Only); INIS.

A possibility is considered of the precision measurement of the τ lepton mass near the production threshold at the VEPP-4M storage ring. It is proposed to use the effect of Doppler broadening of the π meson spectrum in the $\tau \to \pi\nu$ decay. 13 refs.; 7 figs.; 2 tabs.

13606 (IYaF–92-94) **Pseudogoldstone boson decay induced by light and search for the solar axion radiation.** Vorob'ev, P.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 10p. (In Russian). Order Number DE94616907. Source: OSTI; NTIS (US Sales Only); INIS.

A process of the light-induced decay of the axions with mass of 1-3 eV is discussed. The process may be serve a base for the new type detectors for searches of the solar axion radiation and the condensate of axions with mass about 1 eV, which constitute, possibly, the Universe hidden mass. 7 refs.; 2 figs.

13607 (JINR–2-93-59, pp. 47-52) **Investigation of neutrino-electron scattering using of high-intensity neutrino sources.** Golubchikov, A.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Zajmidoroga, O.A.; Smirnov, O.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

It has been shown that using of high-intensity neutrino sources exceeding the neutrino flux from the Sun allows one to investigate the neutrino-electron scattering and peculiarities of neutrino in laboratory. The investigation has been performed at the Particle Physics Laboratory, JINR. refs. 8.

13608 (JINR–6-92-57, pp. 18-23) **Another possibility of conserved-vector-current hypothesis verification.** Dubnichkova, A.Z. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Dubnichka, S.; Rekalo, M.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

Based on the conserved-vector-current (CVC) hypothesis and a four-p-resonance unitary and analytic VMD model of the pion electromagnetic form factor, the behaviour of a total cross section and energy distribution if the finel state pions of $\nu\text{-bar}_e e^- \to \pi^-\pi^0$ process are predicted theoratically for the first time. An experimental testing of the latter could provide another reliable method of CVC-hypothesis verification for all energies above the two-pion threshold. 7 refs.; 3 figs.

13609 (JINR–6-92-57, pp. 24-31) **Proton-proton bremsstrahlung and narrow diproton resonances.** Gerasimov, S.B. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Khrykin, A.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility is suggested and discussed of using the bremsstrahlung reaction in proton-proton interactions as a new tool

for searching and investigating the narrow diproton resonances. 12 refs.; 3 figs.

13610 (JINR–6-92-57, pp. 39-45) **Graphical interface for PPDS system based on PAW.** Ivanov, V.V.; Stolyarskij, Yu.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection*. 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The program interface allowing to display graphically experimental measurements results and evaluations of various physical reactions parameters stored in the REACTIONS database of PPDS system is described. PAW package is used for experimental data visualization. 7 refs.; 2 figs.; 3 tabs.

13611 (JINR-E–4-93-196) **Radiative and rare μ and π decays.** Arbuzov, A.B. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Kuraev, E.A.; Makhaldiani, N.V.; Merenkov, N.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 14p. Order Number DE94618549. Source: OSTI; NTIS (US Sales Only); INIS.

The width of the radiative decay of polarized muon has been calculated. The distribution in the hard part of the final electron spectra is presented. Also the integrated width for some electron energy cuts has been estimated. The radiative corrections to the pion β-decay are considered, as well as some background processes. 6 refs.

13612 (JINR-R–10-93-271) **Simple and efficient method of secondary vertex searching.** Ivanov, V.V.; Pontekorvo, D.B. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation; Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 14p. (In Russian). Order Number DE94618542. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to the Proceedings of the International Conference on Programming and Mathematical Methods of Solving Physical Problems, Dubna, 14-19 June, 1993.

New variables permitting effective selection of events containing a secondary vertex are proposed. Reconstruction of an event and searing for the primary and secondary vertices are not required for this purpose. If a neural network is utilized for classification of events in the space of these variables, then the identification of signal and background events will partially be totally unambiguous. 8 refs.; 11 figs.

13613 (Juel–2701) **The pion production in the kaon-nucleon interaction described in the meson-exchange picture.** Wyborny, P. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik; Bonn Univ. (Germany). Dec 1992. 217p. (In German). Order Number DE94746040. Source: OSTI; NTIS (US Sales Only); INIS.

Recently we have presented in our group a meson exchange model for the K+N interaction below pion threshold which contains apart from single-meson exchange, higher-order diagrams involving ΔK,NK^* and ΔK^* intermediate states. We now extend this model above pion threshold (i.) by taking into account the K^*- and Δ-width, calculated in a generalized Lee model, (ii.) by doing a full coupled-channel calculation, under inclusion of the diagonal ΔK and NK^* interaction based likewise on meson exchange. It turns out that the latter interaction as well as the off-shell behaviour of the widths are essential for reproducting the pion production data in both isospin channels. (orig.)

13614 (LAL–91-69) **Experimental aspects of heavy flavour physics at LEP.** Roudeau, P. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Dec 1991. 63p. (CONF-9105441–: 19. International meeting on fundamental physics, St. Feliu de Guixols (Spain), 6-10 May 1991). Order Number DE94618555. Source: OSTI; NTIS (US Sales Only); INIS.

Experimental details of Heavy quark physics at LEP are described. Hadronic Z^0 decays and first results on B physics are discussed. Production rates of bb-bar and cc-bar events at the Z^0 pole, the forward-backward asymmetry in b quarks production and the B^0-B-bar^0 oscillation measurements are presented. Heavy hadron properties, such as B lifetime and polarization are discussed, and future prospects are also outlined. (K.A.) 68 refs.; 56 figs.; 10 tabs.

13615 (LAL–91-74) **Physics at LEP200.** Augustin, J.E. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Dec 1991. 20p. (CONF-9110332–: International workshop on electroweak physics beyond the standard model, Valencia (Spain), 2-5 Oct 1991). Order Number DE94618528. Source: OSTI; NTIS (US Sales Only); INIS.

The LEP200 project will allow to study e^+e^- collisions beyond the W^+W^- threshold. After a brief review of the necessary LEP improvements, the $e^+e^- \rightarrow W^+W^-$ reaction and the measurement of M_W are reviewed as a case study for this collider. Other physics subjects like Higgs and SUSY searches are covered. (author) 15 refs.; 8 figs.

13616 (LA-UR–94-676) **The Nijmegen hyperon-nucleon potentials.** Timmermans, R. Los Alamos National Lab., NM (United States). 17 Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310259–3: U.S./Japan seminar on hyperon-nucleon interactions, Maui, HI (United States), 24-28 Oct 1993). Order Number DE94007557. Source: OSTI; NTIS; INIS; GPO Dep.

The Nijmegen YN potential models are reviewed. Differences with the models constructed by the Juelich group are highlighted. A mini- review is given of the status of the scalar mesons and their relevance for the NN and YN interactions. Finally, the reactions $\bar{N}N \rightarrow \bar{Y}Y$ are discussed.

13617 (LYCEN–9321) **The Gell-Mann-Oakes-Renner relation within the nuclear medium.** Chanfray, G. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Ericson, M.; Kirchbach, M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Apr 1993. 10p. Order Number DE94618550. Source: OSTI; NTIS (US Sales Only); INIS.

The pion decay constant, associated with the time component of the axial current is studied, in the nuclear medium in terms of the pion self-energy. The theoretical scheme exploits chiral properties of the s-wave πN amplitude as previously applied to the study of the medium renormalized pion mass. It is shown the Gell-Mann-Oakes-Renner relation holds to a good approximation in the medium. The renormalizations of the pion decay constant and the pion mass are consistent with that predicted for the quark condensate in the medium. (author) 8 refs.

13618 (LYCEN–9334) **Intrinsic charm contribution to Ψ and Ψ' hadroproduction of nuclei.** Chanfray, G.; Fleck, S. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Jul 1993. 17p. Order Number DE94618543. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters, (Section) B (NL).

The A dependence of the Ψ and Ψ' hadroproduction is studied, and the results are compared to the data of NA3 and E772 collaborations. In addition to the hard production mechanism, a diffractive process is introduced via an intrinsic charm component in the incoming hadron wave-function. Color-transparency effects were taken into account within a quantum mechanical approach, an essential point if one wants to account for the node in the wave-function of the Ψ'. The effect on the Ψ', even if too strong to reproduce the experimental data, is necessary to explain the general trend. (author) 11 refs.; 4 figs.

13619 (MPI-PhE–93-18) **Production processes.** Schmitz, N. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut. Sep 1993. 28p. (CONF-930719–: Conference on the bubble chamber and its role in particle physics, Geneva (Switzerland), 14-16 Jul 1993). Order Number DE94752165. Source: OSTI; NTIS (US Sales Only); INIS.

In this historical review, covering roughly the years from 1960 to 1980, some contributions are presented in an exemplary selection that bubble chambers have made to our understanding of particle production processes within the framework of the following phenomenological models: One-particle exchange (in particular one-pion exchange); Regge-pole exchange; duality, finite-energy

sum rules and Veneziano models; multiperipheral model, multi-Regge exchange, longitudinal phase space and diffraction dissociation. (orig.)

13620 (MPI-PhE–93-19) **Measurement of the mean lifetime of bottom hadrons by the reaction $Z^0 \rightarrow b$ anti b $\rightarrow J/\psi X$ by usage of the silicon vertex detector in ALEPH at the LEP storage ring.** Lauber, J. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut; Muenchen Univ. (Germany). Fakultaet fuer Physik. Sep 1993. 149p. (In German). Order Number DE94747549. Source: OSTI; NTIS (US Sales Only); INIS.

This thesis presents a measurement of the lifetime of the B hadron by usage of the mini-vertex detector and a new identification method for B hadrons by means of the hadronic decay into a J/ψ. The clear signature of the J/ψdecay into a lepton pair is used in order to select 106 such events of the ALEPH data set of the years 1990 and 1991. The inclusive branching ratio of the J/ψproduction in the Z^0 decay results to: $Br(Z^0 \rightarrow J\psi X)=(3.5\pm0.35\pm0.23)x10_{-3}$. The resulting inclusive branching ratio for B hadrons into J/ψmesons $Br(B \rightarrow J\psi X)=(1.13\pm0.12\pm0.08)\%$ is compatible with the world mean value of $(1.12\pm0.16)\%$. Under usage of a simultaneous fit of the signal and background lifetime by the maximum-likelihood method the inclusive lifetime of the B hadrons is determined to: $\tau_B=(1.26_{-0.16}{}^{+0.18}\pm0.05)$ps. With the measured value of the lifetime and the semileptonic branching ratio for the CKM matrix element vertical stroke V_{cb}vertical stroke $=0.044\pm0.007\pm0.003$ is obtained. If the differential branching ratio $dBr(\text{ anti } B^0 \rightarrow D^{**}l \text{ anti } \nu)/dq^2$ is used for the determination of the CKM matrix element vertical stroke V_{cb}vertical stroke $=0.042\pm0.007\pm0.003$ is obtained. (HSI)

13621 (MPI-PhE–93-22) **Results on b hadron lifetimes from ALEPH.** Seywerd, H. ALEPH Collaboration. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut. Oct 1993. 12p. Order Number DE94752164. Source: OSTI; NTIS (US Sales Only); INIS.

Measurements of the inclusive b hadron lifetime and of the lifetime of B^0, $B^{\pm}$, B_s and b baryons are presented. The inclusive b hadron lifetime is determined from the lepton impact parameter, with b events decaying to J/ψ, and using a dipole method. The mean lifetime is: 1.49 ± 0.04 ps. ALEPH has also made measurements of the $B^{(0)(\pm)}$ lifetimes using lepton $D^{(*)(\pm)}$ correlations and from complete reconstruction of B^0 and $B^{\pm}$ events. The ratio of the $B^0/B^{\pm}$ lifetimes is: 1.03 ± 0.21. The B_s lifetime is $1.90\pm_{0.36}{}^{0.46}\pm0.05$ ps. The mean b baryon lietime is: 1.14 ± 0.25 ps. (orig.)

13622 (PCCF-RI–92-02) **Multivariate analysis methods to tag b quark events at LEP/SLC.** Brandl, B. (Heidelberg Univ. (Germany). Inst. fuer Hochenergiephysik); Falvard, A.; Guicheney, C.; Henrard, P.; Jousset, J.; Proriol, J. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1992. 25p. Order Number DE94618556. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods (NL).

Multivariate analyses are applied to tag $Z \rightarrow$ bb-bar events at LEP/SLC. They are based on the specific b-event shape caused by the large b-quark mass. Discriminant analyses, classification trees and neural networks are presented and their performances are compared. It is shown that the neural network approach, due to its non-linearity, copes best with the complexity of the problem. As an example for an application of the developed methods the measurement of $\Gamma(Z \rightarrow$ bb-bar) is discussed. The usefulness of methods based on the global event shape is limited by the uncertainties introduced by the necessity of event simulation. As solution a double tag method is presented which can be applied to many tasks of LEP/SLC heavy flavour physics. (author) 29 refs.; 6 figs.; 1 tab.

13623 (PCCF-RI–92-12) **Tagging b and c quark events in e^+e^- collisions with neural networks.** Proriol, J. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire); Falvard, A.; Henrard, P.; Jousset, J.; Brandl, B. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1992. 9p. (CONF-9206437–: 2. Workshop on neural networks: from biology to high energy physics, Marciana Marina (Italy), 18-26 Jun 1992). Order Number DE94618529. Source: OSTI; NTIS (US Sales Only); INIS.

High purity samples of b quark events and, if possible, of c quark events are attempted to produce, and the width of $\Gamma(Z_0 \rightarrow$ bb-bar) is measured. The different variables and the method to select the most discriminating variables are given. The physical results obtained with these methods are recalled, and new results are presented with variables connected with the impact parameter. Some neural networks used throughout this work and some results on c quark events selection are also presented. (K.A.) 9 refs.; 6 figs.

13624 (PCCF-RI–92-13) **Pattern recognition: invariants in 3D: Application to tag the number of jets in e^+e^- events with a neural network.** Proriol, J. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1992. 5p. (CONF-9206437–: 2. Workshop on neural networks: from biology to high energy physics, Marciana Marina (Italy), 18-26 Jun 1992). Order Number DE94618530. Source: OSTI; NTIS (US Sales Only); INIS.

In e^+e^- events, the jets have a spherical 3D symmetry. A set of invariants are defined for 3D objects with a spherical symmetry. These new invariants are used to tag the number of jets in e^+e^- events. (K.A.) 3 refs.

13625 (PCCF-RI–93-01) **Comparison of 3 methods to classify hadronic events in e^+e^- collisions: cut on the most discriminating variable, discriminant analysis, neural network.** Proriol, J. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 14p. Order Number DE94618531. Source: OSTI; NTIS (US Sales Only); INIS.

Three methods of classification used in high energy physics are compared: cut on the most discriminating variable, discriminant analysis, neural network. These methods are applied to 2 problems: the classification of an hadronic event according to the primary quark, when considering the variables computed from the tracks of the entire event or from only the most energetic jet. Variables extracted from the vertex detector of ALEPH are used, and b and c quark events are considered. (K.A.) 6 refs.; 8 figs.

13626 (PCCF-RI–93-02) **Definition of invariants in 3-D application: study of the number of jets in e^+e^- events.** Proriol, J. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 9p. Order Number DE94618532. Source: OSTI; NTIS (US Sales Only); INIS.

In e^+e^- events, the jets have a spherical 3D symmetry. The usual method to tag the number of jets is the clusterization using classical algorithms. A set of invariants is defined for 3D objects with a spherical symmetry. These new invariants are used to study the number of jets in e^+e^- events. (K.A.) 5 refs.; 2 figs.

13627 (PIYaF–1795) **Elastic p-^{4}He scattering at intermediate energies.** Manaenkov, S.I. AN SSSR, Leningrad (Russian Federation). Inst. Yadernoj Fiziki. 1992. 46p. Order Number DE94618544. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the calculations of the differential cross section and polarization using realistic nuclear wave functions, NN amplitudes obtained in the phase shift analysis and usual corrections to the Glauber theory disagree with the experimental data. 27 refs., 9 figs.

13628 (SLAC–426) **A measurement of the e^+e^- decay width of the Z^0.** Yamartino, J.M. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Feb 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94007257. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Massachusetts Inst. of Technology, Cambridge, MA.

This thesis presents a measurement of the partial decay width of the Z^0 to e^+e^- using data recorded by the SLD at the SLAC Linear Collider during the 1992 run. Based on 354 nb^{-1} of data, the decay width, Γ_{ee} is measured to be $82.4 \pm 3.6/3.7 \pm 0.8$ MeV where the first error is statistical and the second is systematic. By combining this measurement of Γ_{ee} with the SLD measurement of A_{LR}, the magnitude of the effective vector and axial-vector coupling constants of the electron, $\bar{g}_v{}^e$ and $\bar{g}_a{}^e$, are determined to be 0.024 $\pm$ 0.011 and 0.498 $\pm$ 0.011 respectively.

13629 (SLAC–435) **A measurement of the left-right cross section asymmetry in Z^0 production with polarized e^+e^- collisions.** Park, H. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1993. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94007666. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Univ. of Oregon, Eugene, OR.

The Stanford Linear Collider at SLAC is an e^+e^- collider running at $\sqrt{s} \approx M_Z$ and has provided an electron beam with longitudinal polarization at the SLC interaction point. The 1992 polarized run data were taken with the SLD detector. The author presents here the measurement of the left-right cross section asymmetry (A_{LR}) for the 1992 run. The polarized run began in May and ended in September of 1992 at a mean center-of-mass energy of 91.56 GeV. Tower hit information of the liquid argon calorimeter and endcap warm iron calorimeter pads were used for selecting hadronic Z^0 or tau pair events. The SLD detector collected about 11,000 events during this run. The magnitude of the longitudinal polarization of the electron beam was continuously measured by a polarimeter based on Compton scattering, and was monitored by a polarimeter based on Moller scattering. The luminosity-weighted average longitudinal polarization during the 1992 run was measured as 22.4 ± 0.6 (syst.)%. From these data, the value of A_{LR} has been measured to be 0.102 ± 0.044 (stat.) ± 0.003 (syst.), corresponding to an effective electroweak mixing angle ($\sin^2\theta_W^{eff}$) of 0.2375 ± 0.0056 (stat.) ± 0.0004 (syst.). The error is dominated by the statistical error. This value of $\sin^2\theta_W^{eff}$ is in good agreement with existing measurements from other experiments. Studies of improvements in A_{LR} event selection for future high-statistics runs are also discussed.

13630 (SLAC-PUB–6430) **Minimax: Multiparticle physics at the TeVatron collider.** Bjorken, J.D. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jan 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9309297–5: 23. international symposium on multiparticle dynamics, Aspen, CO (United States), 13-17 Sep 1993). Order Number DE94007095. Source: OSTI; NTIS; INIS; GPO Dep.

The author and two dozen others are engaged in a small test/experiment in the Fermilab Tevatron collider. It is called Minimax, and its purpose is to explore large-cross-section physics in the forward direction. The primary goal of Minimax is search for events containing the residue of disoriented chiral condensate (dcc) produced in the primary collision. The theoretical ideas are very speculative. But if they are right, they could provide an interpretation of the Centauro/anti-Centauro anomalies claimed to have been seen in cosmic-ray events. In this paper, the history and status of Minimax is described.

6624 Properties of Specific Particles and Resonances

Refer also to citation(s) 13529, 13530, 13531, 13532, 13536, 13537, 13539, 13540, 13589, 13593, 13594, 13595, 13600, 13607, 13609, 13731, 13733, 13734, 13735, 13786, 13787, 13802

13631 (ANL-HEP-TR–94-12) **A tau – charm – factory at Argonne: Preliminary assessment of the physics case and the Argonne Site.** Berger, E.; Fields, T.; Grosnick, D.; Norem, J.; Repond, J.; Schoessow, P. Argonne National Lab., IL (United States). 2 Feb 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007656. Source: OSTI; NTIS; INIS; GPO Dep.

Depending on the beam energy setting, the τ – charm – factory will be optimized to study physics with τ leptons, with charmed mesons, or with charmonium states. This report gives a short overview of the physics of these topics. Also discussed are the detectors and the costs associated with this project.

13632 (BNL–52389, pp. 29-34) **Sea-quark distributions from QCD sum rules.** Kisslinger, L.S. (Carnegie Mellon Univ., Pittsburgh, PA (United States)); Jung, H. Brookhaven National Lab., Upton, NY (United States). [1993]. Grant PHY-9023586. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The QCD sum rule method has been successful in treating nonperturbative as well as perturbative QCD for hadronic properties at low momentum transfer. Modifying the standard QCD sum rule method by introducing nonlocal condensates, which carry momentum, the authors show that they can calculate quark distributions at the momentum transfers corresponding to the scaling region. Neglecting differences in u and d mass differences and condensates, the authors find a flavour symmetric sea-quark distribution coming from the nonlocal quark condensates, which is in reasonable agreement with experiment. From this result it is estimated the difference between the u and d sea-quark distributions arise from known differences between the u and d condensates and quark masses to be of the order of 1%.

13633 (BNL–52389, pp. 76-81) **Lepton physics at hadron beam facilities.** Reay, N.W. (Ohio State Univ., Columbus, OH (United States)); White, H. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The lepton section of Physics at Hadron Beam Facilities certainly exhibited unity through diversity. Four physics themes unified a vast panorama of experimental approaches, accelerating machines and energy ranges: these included structure functions, semileptonic physics, tests of the standard model, and neutrino oscillations. Leptons were used as a probe of hadronic matter, to study standard weak interaction processes, in precision experiments searching for tiny deviations from the Standard Model of high energy physics, and to look for entirely new effects not found in the Standard Model.

13634 (BNL–52389, pp. 91-92) **A new precision measurement of g - 2.** Worstell, W. (Boston Univ., MA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

A new precision measurement of the muon anomalous magnetic moment is being prepared at Brookhaven National Lab. By increasing the precision of this measurement by a factor of 20 over previous CERN measurements of the muon anomaly, the contribution from electroweak radiative corrections will be measured for the first time. In addition to contributions from virtual W and Z bosons, a precision measurement of the muon anomaly measures standard model contributions from QED (vacuum polarization) and the strong interaction (hadronic vacuum polarization). A muon g-2 measurement consistent with the standard model predictions at the level of sensitivity for E821 (0.35 ppm) will put limits on muon substructure up to TeV energy scales, and will put significant constraints on W boson substructure and a W anomalous magnetic moment. The E821 experiment will also provide the most sensitive search to date for a muon electric dipole moment, which (if nonzero) would violate CP.

13635 (BNL–52389, pp. 104-105) **The muon anomalous magnetic moment and the future muon trap experiments.** Fei, X. (Yale Univ., New Haven, CT (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The goal of the BNL muon g-2 experiment is reviewed and some future activities to improve the knowledge of the muon magnetic moment are discussed.

13636 (BNL–52389, pp. 112-117) **Accelerator-based neutrino oscillation searches.** Whitehouse, D.; Rameika, G.

Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This paper attempts to summarize the neutrino oscillation section of the Workshop on Future Directions in Particle and Nuclear Physics at Multi-GeV Hadron Beam Facilities. There were very lively discussions about the merits of the different oscillation channels, experiments, and facilities, but the authors believe a substantial consensus emerged.

13637 (BNL–52389, pp. 217-222) **Measuring chirally odd wave functions with helicity flip form factors.** Jain, P. (Univ. of Kansas, Lawrence, KS (United States)); Ralston, J.P. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors consider the role of chirally odd wave functions in hard exclusive reactions. Such wave functions have the quarks oriented in the opposite helicity configuration from those assumed in the short-distance limit and are generally associated with non-zero orbital angular momentum. Calculations in the impulse approximation allow for non-zero helicity flip amplitudes while the conventional factorization prescription for exclusive processes does not. By introducing a new approach, the authors show how helicity flip form factors are nevertheless calculable in QCD.

13638 (BNL–52389, pp. 235-240) **Quark spin and fragmentation.** Collins, J.C. (Pennsylvania State Univ., University Park, PA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The author describes how the polarization state of the quark initiating a jet can be analyzed using azimuthal distributions of hadrons in the jet.

13639 (BNL–52389, pp. 247-253) **ϕ Production and the OZI rule.** Gill, D.R. (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The OZI rule, derived primarily from quark based concepts, is violated in ϕ production on the proton. A number of theoretical approaches to this effect have been undertaken, both from quark and meson points of view. A detailed study of the OZI rule and its violation is proposed, in particular to the p_t dependence and polarization parameters of this effect.

13640 (BNL–52389, pp. 290-295) **Hadron spectroscopy: Workshop summary.** Comyn, M. (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The hadron spectroscopy sessions of the Working Group on Hadron and Nuclear Spectroscopy are summarized. The present status of the field is discussed, along with the main priorities and open questions for the future. The required characteristics of optimum future facilities are outlined.

13641 (BNL–52389, pp. 300-310) **Open questions in hadron spectroscopy.** Barnes, T. (ORNL, Oak Ridge, TN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract AC05-84OR21400. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

In this contribution the author briefly summarizes some interesting unsolved problems in hadron spectroscopy, with particular emphasis on recent experimental and theoretical developments in multiquark systems.

13642 (BNL–52389, pp. 340-345) **Strange Dibaryons.** Franklin, G.B.; Athanas, M.; Barnes, P.D.; Bassalleck, B.; Berdoz, A.; Burger, M.; Buerger, T.; Chapman, M.; Chrien, R.; Davis, C.; Diebold, G.; Enyo, H.; Fischer, H.; Franz, J.; Gill, D.; Hamann, N.; Iijima, T.; Imai, K.; Lowe, J.; Magahiz, R.; Maher, C.;Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Strange Dibaryons, six valence-quark hadrons constructed from one or more strange quarks, are predicted to have greater binding than dibaryons in the non-strange sector. The flavor-singlet dibaryon with quark structure "uuddss" is of particular theoretical and experimental interest. A brief review of the status of H dibaryon studies is presented with emphasis on experiment E813 currently taking data at the AGS.

13643 (BNL–52389, pp. 384-389) **The status of glueballs.** Lindenbaum, S.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract AC02-76CH00016. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The Status of Glueballs is presented considering the most popular candidates from among the isoscalars in the $J^{PC} = 0^{++}$, 0^{-+} and 2^{++} channels. It is shown that in the 0^{++} channel the $f_0(1720)$ which was discovered earlier (the $S^{*'}(1720)$) at BNL is highly likely the same state as the SLAC $\theta(1720)$ now that its spin has been found to be 0 instead of the 2 claimed for a long period. In the 0^{-+} channel there is likely a complex of 2-3 states $\zeta/\eta(1280)$, $\lambda/\eta(1420)$ and $\iota/\eta(1520)$ involving at least one extra isoscalar. In the 2^{++}, the $g_T(2010)$, $g_{T'}(2300)$ and $g_{T''}(2340)$ $\phi\phi$ states found in $\pi^-p \rightarrow \phi\phi n$ (OZI forbidden glueball filter channel) strikingly, approximately, completely break the OZI suppression and comprise within the errors all the $\phi\phi$ cross-section. The only viable explanation of these states in the context of QCD is that they are produced by 1-3 primary 2^{++} glueballs. All alternate explanations in the past 15 years have failed.

13644 (BUDKERINP–93-4) **Higgs->two photon decay: QCD radiative correction.** Mel'nikov, K.; Yakovlev, O. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1993. 11p. Order Number DE94618569. Source: OSTI; NTIS (US Sales Only); INIS.

QCD radiative correction to Higgs→two photons decay rate is calculated Below the threshold negligible correction is found. Above the threshold radiative correction appears to be large for both real and imaginary part of $H \rightarrow \gamma\gamma$ vertex. This leads to radiative correction for $\Gamma(H \rightarrow \gamma\gamma)$ to be order 20-100 percents at m_t=150 GeV. Possible application of the results for Higgs search at Next Linear Colliders are briefly discussed. 9 refs.; 6 figs.

13645 (CONF-9306258–) **Proceedings of the workshop on B physics at hadron accelerators.** McBride, P. (Superconducting Super Collider Lab., Dallas, TX (United States)); Mishra, C.S. Fermi National Accelerator Lab., Batavia, IL (United States). [1993]. 765p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. From Workshop on B physics at hadron accelerators; Snowmass, CO (United States); 21 Jun - 2 jul 1993. Order Number DE94007961. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains papers on the following topics: Measurement of Angle α; Measurement of Angle β; Measurement of Angle γ; Other B Physics; Theory of Heavy Flavors; Charged Particle Tracking and Vertexing; e and γ Detection; Muon Detection; Hadron ID; Electronics, DAQ, and Computing; and Machine Detector Interface. Selected papers have been indexed separately for inclusion the in Energy Science and Technology Database.

13646 (DESY–93-022) **CKM parameter fits, the B_s^0- anti B_s^0 mixing ratio x_s and CP-violating phases in B decays.** Ali, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); London, D. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Feb 1993. 29p. (UdeM-LPN-TH–138). Order Number DE94752374. Source: OSTI; NTIS (US Sales Only); INIS.

We review and update constraints on the parameters of the flavour mixing matrix (V_{CKM}) in the Standard Model. In performing these fits, we use inputs from the measurements of parallel ϵ parallel , the CP-violating parameter in K decays, $x_d = (\Delta M)/\Gamma$, the mixing parameter in B^0_d- anti B^0_d mixing, and the present measurements of the matrix elements parallel V_{cb} parallel and parallel V_{ub} parallel . We take into account the next-to-leading order QCD results in our analysis, wherever available, and incorporate results stemming from the ongoing lattice calculations of the B-meson coupling constants, which predict a value $f_{Bd} = 200 \pm 30$ MeV, though for the sake of comparison we also show the CKM fits for smaller values of f_{Bd}. We use the updated CKM matrix to predict the mixing ration x, relevant for B^0_s- anti B^0_s, mixing, and the phases in the CKM unitarity triangle, sin 2α, sin 2β and sin 2γ, which determine the CP-violating asymmetries on B-decays. The importance of measuring the ratio x, in restricting the allowed values of the CKM parameters is emphasized. (orig.)

13647 (FNAL/C–92/261) **Neutrino physics at Fermilab in the 1990s.** Bernstein, R.H. Fermi National Accelerator Lab., Batavia, IL (United States). Oct 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9206227–8: 15. international conference on neutrino physics, Granada (Spain), 7-13 Jun 1992). Order Number DE94008269. Source: OSTI; NTIS; INIS; GPO Dep.

Three sets of proposed neutrino experiments at Fermilab are discussed. The first experiment (E-815) is a continuation of the deep-inelastic scattering program at the Tevatron, performing precise measurements of the weak mixing angle and structure functions. The second (P-860) is a proposal to use the Fermilab Debuncher to search for neutrino oscillations. The third is a suggestion for a tagged neutrino beam which could be of use in measuring neutrino oscillation parameters.

13648 (FNAL/C–94/006-E) **The CDF top search in the multijet decay mode.** Denby, B. (Institute Nazionale di Fisicia Nucleare, Piero a Gardo, (Italy). Sezione di Pisa). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–20: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94008223. Source: OSTI; NTIS; INIS; GPO Dep.

A status report on the CDF top search in the multijet channel is given. After topological cuts and the requirement of a secondary vertex in the silicon microvertex detector, about 120 events remain (21.4 pb^{-1}), in which the signal to background ratio (for a nominal top mass of 160 GeV) is estimated to be 1/10. With further improvements it should be possible to improve this ratio to 1/1 while retaining good efficiency for top, which will make the multijet channel an important cross check for the leptonic modes.

13649 (FNAL/C–94/014-E) **Direct photon plus charm quark production at CDF.** Kuhlmann, S. (Argonne National Lab., IL (United States)). Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–19: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94007394. Source: OSTI; NTIS; INIS; GPO Dep.

New measurements of direct photon production in association with a charm quark are presented. comparisons are made with a QCD prediction.

13650 (FNAL/C–94/021-E) **Production of W and Z bosons at D0.** Graf, N.A. (Brookhaven National Lab., Upton, NY (United States)). The D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–17: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94007398. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results from the DO experiment are presented on production properties of the $W^{\pm}$ and Z^0 gauge bosons using final states containing electrons and muons. The DO detector has accumulated 16.7 pb^{-1} of data at the Fermilab $\bar{p}p$ Tevatron collider. Based on a subset of this data preliminary measurements of the $W^{\pm}$ and Z^0 production cross section and a measurement of α_s at $Q^2 = M_W{}^2$ derived from the ratio of W + 1jet to W + 0jets is presented.

13651 (FNAL/C–94/031) **Hyperon polarization, crystal channeling, and E781 at Fermilab.** Lach, J. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310259–4: U.S./Japan seminar on hyperon-nucleon interactions, Maui, HI (United States), 24-28 Oct 1993). Order Number DE94008224. Source: OSTI; NTIS; INIS; GPO Dep.

Early experiments at Fermilab observed significant polarization of inclusively produced hyperons. these and subsequent experiments showed that Λ° were produced polarized while $\bar{\Lambda}^\circ$ had no polarization in the same kinematical region. Other hyperons and antihyperons were also seen to be polarized. Recent Fermilab experiments have showed this to be a rich and complex phenomena. Theoretical understanding is still lacking. Fermilab E761 has shown that bent single crystals can be used to process the polarization of hyperons and from the precession angle measure the hyperon's magnetic moment. This opens the possibility of measuring the magnetic moments of charmed baryons. Finally, I will briefly discuss Fermilab E781, an experiment designed to study charmed particle production by Σ^- hyperons.

13652 (FNAL/C–94/036-E) **Search for supersymmetry and leptoquark states in D0.** White, J.T. (Texas A and M Univ., College Station, TX (United States). Dept. of Physics). D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jan 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9310247–18: 9. workshop on proton-antiproton collider physics, Tsukuba (Japan), 18-22 Oct 1993). Order Number DE94007400. Source: OSTI; NTIS; INIS; GPO Dep.

Results are presented on the search for two types of exotic particles. First, a mass limit is given for first generation leptoquarks assuming pair production with the final state being either two electrons and two jets or one electron, a neutrino and two jets. This is followed by the presentation of a preliminary result on a search for the supersymmetric partners of the $W^{\pm}$ and Z^o, the lightest chargino, W symmetry particle $_1$, and the second lightest neutralino, Z symmetry particle $_2$ via a trilepton signature.

13653 (INIS-mf–13780, pp. 48-49) **Search for b quark and t quark by e^+e^- interactions at A M Y detector of Japan.** Zomoorodian, M.A. Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRON-POSITRON INTERACTIONS/ quarks; QUARKS; GEV RANGE 10-100; STANDARD MODEL

13654 (INP-MSU–92-41-290) **Higgs signal in the $e^+e^- \rightarrow Zbb$-bar process at LEP200.** Boos, E.E.; Dubinin, M.N. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation).

Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 12p. (NIIYaF-MGU-92-41-290.). Order Number DE94618570. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility to detect the Higgs boson signal in the process $e^+e^- \rightarrow Zbb\text{-bar}$ at LEP200 energies is considered. The calculations are performed in the tree approximation for complete set of diagrams. If the highest possible LEP200 energy will be $\sqrt{s}$=190 GeV the Higgs signal is very clean for the masses of the Higgs up to $\sqrt{s} - M_z \approx 95$ GeV. 8 refs., 4 figs.

13655 (MPI-PhE-93-24) **τphysics.** Schwarz, A.S. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut. Oct 1993. 28p. (CONF-930823-: 16. international symposium on lepton and photon interactions, Ithaca, NY (United States), 10-15 Aug 1993). Order Number DE94752163. Source: OSTI; NTIS (US Sales Only); INIS.

In the last two years there has been a large influx of new data on the physics of the τ lepton from three different center of mass energy regions in e^+e^- annihilation: The threshold region (BEPC), the region around the Y(4S) resonance (CESR and DORIS) and the Z^0 (LEP). Many of the recent advances could be achieved by major improvements in either statistics (CLEO II at CESR), purity of event samples (LEP) and/or detector technology. In this article, a review of the most recent experimental results is given with special emphasis on the question of e-μ-τ lepton universality in the neutral and charged current interactions as well as recent advances in the study of the τ hadronic final state. (orig.)

13656 (PCCF-RI-93-09) **Determination of the neutron spin structure function.** Anthony, P.L. (Lawrence Livermore National Lab., CA (United States)); Arnold, R.G.; Band, H.R. E142 Collaboration. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 15p. Order Number DE94618561. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review Letters (US).

The spin structure function of the neutron, g_1^n, has been determined over the range $0.03<x<0.6$ at an average Q^2 of 2 $(GeV/c)^2$ by measuring the asymmetry in deep inelastic scattering of polarized electrons from a polarized ^3He target at energies between 19 and 26 GeV. The integral of the neutron spin structure function is found to be $\int_0^1 g_1^n(x)dx=-0.022\pm0.011$. Earlier reported proton results together with the Bjorken sum rule predict $\int_0^1 g_1^n(x)dx=-0.065\pm0.019$. (author) 22 refs.; 3 figs.

13657 (PCCF-RI-93-10) **Nucleon structure study by virtual Compton scattering.** Audit, G. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee); Bernheim, M.; Fournier, G.; Gousset, T.; Guichon, P.A.M.; Berthot, J.;Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. 24p. Order Number DE94618562. Source: OSTI; NTIS (US Sales Only); INIS.

It is proposed to study nucleon structure by virtual Compton scattering using the Hall A HRS spectrometers. This reaction is planned to be measured in the Roper resonance region and at the highest center of mass energy to observe the beginning of the hard scattering regime. (author) 25 refs.; 8 figs.; 6 tabs.

13658 (SLAC-424) **Measurements of gluon spin-sensitive quantities at the Z^0 resonance.** Fan, C.G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Oct 1993. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94007665. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Univ. of Colorado, Boulder, CO.

Measurements have been made of the scaled jet energies (x_1, x_2, x_3) and the Ellis-Karliner angle ($\cos\theta_{EK}$), which are sensitive to the spill of the gluon, in the 3-jet hadronic events from the e^+e^- annihilation at the Z^0 resonance. The experiment is performed with the SLD detector at the Stanford Linear Accelerator Center (SLAC). The data used in this analysis was collected during the 1992 physics run, which includes 10,252 hadronic Z^0 events that have CDC information written out. Only charged tracks measured in the central drift chamber are used for the measurements of the above variables. The raw data are found to be in good agreement with the Monte Carlo simulations passing the same set of track and event selection cuts. A bin-to-bin correction is done for the distributions of x_1, x_2, x_3, and $\cos\theta_{EK}$ to account for the effects of hadronization, detector acceptance and resolution. The corrected data is compared to the parton level distributions of x_1, x_2, x_3, and $\cos\theta_{EK}$ simulated from the vector QCD model and the scalar gluon model respectively. The systematic errors, calculated for all the bins in these distributions, are obtained by comparing the results from different sets of track and event selection cuts, from different hadronization models and from different Monte Carlo programs. Good agreement is found between data and the vector QCD model. The scalar gluon model strongly disagrees with the data.

13659 (SLAC-PUB-6328) **The form factors of the nucleons.** Petratos, G.G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Dec 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9307145-3: Workshop on electron nucleus scattering, Elba (Italy), 5-10 Jul 1993). Order Number DE94007096. Source: OSTI; NTIS; INIS; GPO Dep.

The study of the electromagnetic form factors of the nucleons are of fundamental importance in understanding nucleon structure. The form factors contain all the information about the deviation from pointlike structure of the charge and magnetization current distributions of the nucleons. The hope is that measurements at sufficiently large momentum transfers can provide a microscopic understanding of the nucleon wave functions in terms of their constituent quark amplitudes. Recent measurements of the electric $G_E(Q^2)$ and magnetic $G_M(Q^2)$ form factors of the nucleons are reviewed and compared to theoretical calculations based on non-perturbative QCD sum rules, diquark, relativistic constituent quark, and vector meson dominance (VMD) models. A short summary of ongoing and future measurements is also presented.

13660 (UWThPh-1993-29) **Cerenkov radiation of neutrinos.** Grimus, W.; Neufeld, H. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 5 Jul 1993. 8p. Project No. P8485-TEC. Order Number DE94618567. Source: OSTI; NTIS (US Sales Only); INIS.

We consider Cerenkov radiation emitted by neutral particles with a non-zero magnetic and/or electric dipole moment. As an application we estimate the number of photons generated by the solar neutrino flux in water. With and effective neutrino magnetic moment of 10^{-10} μ_B around 50 photons in the range of visible light would be produced per day in a volume of 1 km^3. (authors). 11 refs.

13661 (UWThPh-1993-36) **Effects of scalar exchange and neutrino magnetic and electric dipole moments in $\nu_e e^-$ scattering.** Stockinger, P.; Grimus, W. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 15 Sep 1993. 10p. Order Number DE94618568. Source: OSTI; NTIS (US Sales Only); INIS.

We consider elastic $\nu_e e^-$ scattering where ν_e is a Dirac neutrino furnished with a magnetic and/or electric dipole moment. The effects of additional scalar interactions are analysed with emphasis on the interference of scalar and electromagnetic amplitudes and a possible azimuthal asymmetry in the scattering of the solar neutrino flux. (authors).

13662 (UWThPh-1993-39) **The chiral anomaly in non-leptonic radiative kaon decays.** Neufeld, H. Vienna Univ. (Austria). Inst. fuer Theoretische Physik. 13 Sep 1993. 12p. Project No. P08485-TEC. Order Number DE94618564. Source: OSTI; NTIS (US Sales Only); INIS.

Also published in the proceedings of Hadron Structure '93.

The weak radiative kaon decays $K\rightarrow\pi\pi\gamma(\gamma)$ and $K\rightarrow\pi\pi\pi\gamma(\gamma)$ are sensitive to the chiral anomaly. Chiral perturbation theory is the appropriate framework for an investigation of these processes. The phenomenology of the decays $K^+ \rightarrow \pi^+\pi^0\gamma$ and $K_L \rightarrow \pi^+\pi^-\gamma$ is discussed in some detail.

6630 Nuclear Physics

Refer also to citation(s) 13396

13663 (DOE/ER/40561-118) **Large amplitude collective nuclear motion and soliton concept.** Kartavenko, V.G. (Washington

Univ., Seattle, WA (United States). Inst. for Nuclear Theory). Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory. [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94007268. Source: OSTI; NTIS; INIS; GPO Dep.

An application of a soliton theory methods to some nonlinear problems in low and intermediate energies (E ≈ 10–100MeV/nucleon) nucleus - nucleus collisions are presented. Linear and nonlinear excitations of the nuclear density are investigated in the framework of nuclear hydrodynamics. The problem of dynamical instability and clusterization phenomena in a breakup of excited nuclear systems are considered from the points of view of a soliton concept.

6631 Nuclear Structure

Refer also to citation(s) 13703, 13738, 13740, 13741, 13742, 13743, 13776, 14251

13664 (ANL/PHY/PP–74767) **An improved choice of oscillator basis for banana shaped nuclides.** Chasman, R.R. Argonne National Lab., IL (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008130. Source: OSTI; NTIS; INIS; GPO Dep.

The question of the appropriate choice of oscillator basis functions for studying exotic nuclear shapes is raised. Difficulties with the conventional choice of oscillator basis states are noted for shapes having a large banana component. A prescription for an improved oscillator basis to study these shapes is given. It can be applied in a more general context. New calculations with this improved basis are presented for the banana deformation mode. The change of basis gives results that improve the prospects of finding states in the banana minimum for many isotopes of Tl, Pb and Bi.

13665 (BNL–49960) **Global phenomenology of mean field structure and phase transitional behavior in nuclei.** Zamfir, N.V. (Brookhaven National Lab., Upton, NY (United States)); Casten, R.F.; Brenner, D.S. Brookhaven National Lab., Upton, NY (United States); Clark Univ., Worcester, MA (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG02-88ER40417. (CONF-940161–2: 17. nuclear physics symposium, Oaxtepec (Mexico), 3-7 Jan 1994). Order Number DE94007177. Source: OSTI; NTIS; INIS; GPO Dep.

Correlation schemes of nuclear properties provide a powerful organizing principle for nuclear phenomenology. Mean field observables can be systematized in the framework of Valence Correlation Schemes. Direct Correlations Schemes provide new signatures to identify particular structure. The correlations of yrast energies give a new tripartite global characterization of the evolution of nuclear structure. The linking regions where the major structural changes occur can be interpreted in terms of critical phase transitions.

13666 (BNL–52389, pp. 298-299) **Strange particle nuclear physics: Workshop summary.** Dover, C.B. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Several sessions of the Working Group on Hadronic and Nuclear Spectroscopy dealt with different aspects of strange particle nuclear physics, including hyper-nuclear spectroscopy, strange dibaryons, and K^+ interactions with nuclei. Recent developments in this area are summarized here, and open questions are identified. Some prospects for optimum use of existing facilities, as well as the desired characteristics of future ones, are discussed.

13667 (BNL–52389, pp. 317-322) **Open questions in hypernuclear structure and decays.** Millener, D.J. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors outline the current status of knowledge of the structure and weak decays of Λ hypernuclei. To make significant progress, good energy resolution and the ability to perform coincidence experiments are required. This in turn requires secondary beams of pions and kaons of high intensity and quality, matched with the appropriate detection systems. Considerable progress could be made at existing facilities, such as the Brookhaven AGS, with the addition of new spectrometers (probably old ones moved from elsewhere). In particular, there are prospects for studying S = −2, (mixed) Ξ and $\Lambda\Lambda$ hypernuclear systems.

13668 (BNL–52389, pp. 323-327) **Resonances in the ΣNN system.** Gibson, B.F. (Los Alamos National Lab., NM (United States)); Afnan, I.R. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors first review certain unique aspects of few-body Λ-hypernuclei and then explore the physics of Σ-hypernuclei that would produce structure near the Σ threshold in few-body elastic scattering and reactions. In particular, the authors discuss a predicted enhancement in the Λd cross section near the ΣNN threshold in terms of poles in the T = O Y N N amplitude. A brief discussion of anticipated poles in the T = 1 amplitudes is also given.

13669 (BNL–52389, pp. 335-339) **Doubly strange hypernuclei.** May, M. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract AC02-76CH00016. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Doubly strange hypernuclei are fundamental for understanding proposed new particles and states of matter containing two or more units of strangeness. Experiments are required to confirm the existence of $\Lambda\Lambda$ hypernuclei, measure their lifetimes, binding energies, and decay modes, and search for possible anomalies. An experiment to observe and study them is planned utilizing the higher intensity beams now available at the AGS. Detailed study will require further improvements in intensity and facilities. Facility requirements for future experiments are discussed.

13670 (CEA-CONF–11443) **Relativistic models of nuclear structure.** Gillet, V. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee); Kim, E.J.; Cauvin, M.; Kohmura, T.; Ohnaka, S. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee. 1991. 20p. (CONF-9108253–: New Trends in Theoretical and Experimental Nuclear Physics, Predeal (Romania), 26 Aug - 7 sep 1991; DPhT–91-64.). Order Number DE94618588. Source: OSTI; NTIS (US Sales Only); INIS.

The introduction of the relativistic field formalism for the description of nuclear structure has improved our understanding of fundamental nuclear mechanisms such as saturation or many body forces. We discuss some of these progresses, both in the semi-classical mean field approximation and in a quantized meson field approach. (author).

13671 (CEA-CONF–11449) **Longwavelength excitations of the quark-gluon plasma.** Blaizot, J.P.; Iancu, E.; Ollitrault, J.Y. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique. 1993. 17p. (CONF-9302117–: Interdisciplinary workshop on statistical description of transport in astro- and nuclear physics, Les Houches (France), 2-11 Feb 1993). Order Number DE94618585. Source: OSTI; NTIS (US Sales Only); INIS.

At high temperature, nuclear matter turns into a plasma made of the nucleon constituents, the quarks and the gluons which are then weakly interacting. Such a plasma, called the quark-gluon plasma, has many features in common with the electromagnetic plasma composed of electrons, positrons and photons. In particular it sustains collective excitations which have many interesting features partly reviewed in this note. (author).

13672 (DOE/ER/40561–121) **Application of the resonating Hartree-Fock theory to the Lipkin model.** Nishiyama, Seiya (Univ. of Washington, Seattle, WA (United States). Inst. for Nuclear Theory). Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory. [1993]. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94007271. Source: OSTI; NTIS; INIS; GPO Dep.

In order to make clear essential features of the resonating Hartree-Fock (Res HF) theory for a Fermion system with large quantum fluctuations and to show its superiority over the usual HF theory, the authors apply it to the exactly solvable Lipkin model. They use a new direct optimization algorithm to optimize orbitals in nonorthogonal Slater determinants (S-dets) in a Res HF wave function. For the sake of simplicity, they assume a Res HF wave function to be superposed by two S-dets $|g_1>$ $|g_2>$ which give corresponding two local energy minima of monopole deformation. They make the self-consistent Res HF calculation so as to minimize the energy functional including up to the second order variation. The Res HF ground state generated with only two S-dets brings the ground state energy very near to the exact one and then explains most of the ground state correlation energy.

13673 (GANIL-P–93-01) **Linear response in stochastic mean-field theories and the onset of instabilities.** Colonna, M. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)); Chomaz, Ph.; Randrup, J. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 4 Jan 1993. 23p. Contract DE-AC03-76SF00098. Order Number DE94618612. Source: OSTI; NTIS (US Sales Only); INIS.

The small amplitude response of stochastic one-body theories, such as the Boltzmann-Langevin approach is studied. Whereas the two-time correlation function only describes the propagation of fluctuations initially present, the equal-time correlation function is related to the source of stochasticity. For stable systems it yields the Einstein relation, while for unstable systems it determines the growth of the instabilities. These features are illustrated for unstable nuclear matter in two dimensions. (author) 14 refs.; 5 figs.

13674 (GANIL-P–93-08) **Width of giant dipole resonances and life time of compound nuclei.** Chomaz, Ph. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 11p. Order Number DE94618589. Source: OSTI; NTIS (US Sales Only); INIS.

The fact that the width of the hot Giant Dipole Resonance (GDR) must contain contributions coming from the finite life time of the compound nucleus is discussed. Since the width of the compound nucleus rapidly increases with temperature it will eventually dominate over the spreading width of the GDR. This may explain the observed suppression of the GDR at high excitation energy. (author) 16 refs.; 2 figs.

13675 (GANIL-P–93-10) **Hot giant dipole resonances.** Chomaz, Ph. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 29p. Order Number DE94618590. Source: OSTI; NTIS (US Sales Only); INIS.

Several phenomena are discussed which can affect the properties of the Giant Dipole Resonance (GDR) built on excited states. The effect of the N over Z ratio in the entrance channel is proposed to be studied to demonstrate that the saturation of the GDR strength is not due to preequilibrium effects. Two alternative explanations are discussed. The first one is based on the idea that the finite life time of the compound nucleus gives a finite width for any of the compound nucleus levels. The second explanation relies on the fact that each individual particle emission induces a strong fluctuation of the dipole moment of the nucleus. Therefore, the description of the dipole collective variable is asking to the problem of a Brownian motion in an harmonic potential. (K.A.) 17 refs.; 14 figs.

13676 (GSI–93-20) **Double-γdecay of the electromagnetically excited double giant dipole resonance in ^{208}Pb.** Ritman, J.L. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics. May 1993. 133p. Order Number DE94747630. Source: OSTI; NTIS (US Sales Only); INIS.

In this work the electromagnetic excitation of high lying collective states has been studied in relativistic heavy ion collisions. The interaction in peripheral collisions is dominated by the exchange of high energy virtual photons. Heavy systems near 1 A GeV produce a virtual photon field that is highly luminous and of sufficiently short duration to enable the multiple excitation of Giant Resonances with high probability. In particular, the double excitation of the Giant Dipole Resonance (GDR) has been studied in this work by measuring the photons emitted in peripheral reactions with the system 1 A GeV ^{209}Bi on ^{208}Pb with the Two Arm Photon Spectrometer (TAPS) at SIS/GSI in Darmstadt, Germany. (orig.)

13677 (GSI–93-26(prepr.)) **A generalized quantum kinetic equation and its application to models of relativistic nuclear dynamics.** Prozorkevich, A.B. (Saratovskij Gosudarstvennyj Univ., Saratov (Russian Federation). Physics Dept.); Smoliansky, S.A.; Toneev, V.D. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 26p. Order Number DE94752363. Source: OSTI; NTIS (US Sales Only); INIS.

D.N. Zubarev's method of non-equilibrium statistical operator is applied to problems of relativistic kinetic theory. Within this method, a generalized relativistic quantum kinetic equation with collision integrals of the first and second orders in the coupling constant is derived. It is shown that this result holds valid in the case of gauge invariant theories as well. An advantage of the developed approach is exemplified by models of relativistic nuclear matter. (orig.)

13678 (GSI–93-27(prepr.)) **Bose-condensation through resonance decay.** Ornik, U. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Pluemer, M.; Strottman, D. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 15p. Order Number DE94752362. Source: OSTI; NTIS (US Sales Only); INIS.

We show that a system described by an equation of state which contains a high number of degrees of freedom (resonances) can create a considerable amount of superfluid (condensed) pions through the decay of short-lived resonances, if baryon number and entropy are large and the dense matter decouples from chemical equilibrium earlier than from thermal equilibrium. The system cools down faster in the presence of a condensate, an effect that may partially compensate the enhancement of the lifetime expected in the case of quark-gluon-plasma formation. (orig.). 3 figs.

13679 (GSI–93-28(prepr.)) **Relativistic hydrodynamics with QHD-I equation of state.** Menezes, D.P. (Universidade Federal de Santa Catarina, Florianopolis, SC (Brazil). Dept. de Fisica); Navarra, F.S.; Nielsen, M.; Ornik, U. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 21p. Order Number DE94752361. Source: OSTI; NTIS (US Sales Only); INIS.

We derive the equation of state of the QHD-I lagrangian in a classical approach. The obtained equation of state is then used as input in a relativistic hydrodynamical numerical routine. Rapidity and transverse momentum distributions are calculated and compared with experimental data on heavy ion collisions obtained at BNL-AGS and CERN-SPS. (orig.). 7 figs.

13680 (HMI-B–508) **Spectroscopy of simple shell model states in ^{208}Pb.** Schramm, M. Technische Univ. Berlin (Germany). Fachbereich 4 - Physik; Hahn-Meitner-Institut Berlin GmbH (Germany). Bereich Schwerionenphysik. Mar 1993. 115p. (In German). Order Number DE94747575. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this work was the investigation of excited states in ^{208}Pb by means of high resolution γ-spectroscopy. Two different types of experiments were performed: Quasi- and deep-inelastic excitation of ^{208}Pb with heavy neutron-rich projectiles near the Coulomb barrier and direct ^{207}Pb(d, pγ)^{208}Pb reactions. γ-γ and proton-γ-coincidences have been measured. 105 new γ-transitions and 30 yet unknown states up to the neutron binding energy E^*=7.37 MeV and to I^π=14$^-$, the highest possible spin with one

particle-one hole excitation, have been identified. Including already known data the level energies have been determined with high precision. Spectroscopic factors determined from the (d, pγ) experiment and assigned to specific levels, together with γ-branching ratios allowed to fix the wavefunctions of many states and all up to E*=5 MeV reliably. Results of other measurements have been used in the calculation. (orig.)

13681 (INP–1582/PL) **Microscopic group theoretical formulation of nuclear collective dynamics.** Cerkaski, M. (Institute of Nuclear Physics, Cracow (Poland)); Mikhailov, I.N. Institute of Nuclear Physics, Cracow (Poland). 1992. 39p. Order Number DE94616967. Source: OSTI; NTIS (US Sales Only); INIS.

Assuming an O(N-1) symmetry for the interaction term in the N-body Hamiltonian we find a closed subsystem of equations describing the collective motion in a classical way. When studying, in the group geometric way, the mutual correspondency of O(N-1) invariant approach with the Sp(6,R) collective model we find that the nucleons move along trajectories determined by an effective one-body time-dependent harmonic potential being a function of the collective variables. The relation between the equations for the collective motion and the system of equations found elsewhere for the second order moments of the Wigner distribution function is discussed. A class of stationary solutions to the collective equations of motion leads to the cranking model with the selfconsistency relations depending on the O(N-1) scalar part of the potential. 52 refs. (author).

13682 (ITF–92-33R) **Matrix elements of unitary and Hamiltonian operator between the generating wave packages of the three-body channel a+n+n.** Filippov, G.F.; Vasilevskij, V.S.; Nesterov, A.V.; Rybkin, I.Yu. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 28p. (In Russian). Order Number DE94618591. Source: OSTI; NTIS (US Sales Only); INIS.

Three different oscillator bases are proposed for the description if three-cluster states within the framework of the algebraic version of the resonating group method. The first, 'spherical' basis includes functions with simple permutation symmetry which are more appropriate for the account of Paul 1 principle and the identification of 'forbidden' states. The second, 'hyperspherical' basis is more convenient for the study of the Fourier coefficients asymptotics. Finally, the third, Brink basis is introduced to simplify the calculation of the potential energy matrix elements. The transition matrices between these bases are constructed and the generating matrix elements of the Hamiltonian are calculated. (author). 8 refs.

13683 (ITF–93-14R) **Basis functions and matrix elements of the effective Hamiltonian in the model of four rotators.** Tereshin, Yu.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. (In Russian). Order Number DE94618613. Source: OSTI; NTIS (US Sales Only); INIS.

The algorithm for the solution of the dynamic equation describing the valence nucleons of the p-shall is proposed. The wave functions with a definite SU(3) symmetry and a fixed Young pattern are constructed in the Bargeman-Fock space. (author). 5 refs.

13684 (ITP–92-51E) **Bubble free energy in a first-order phase transition.** Jenkovszky, L.L.; Kaempfer, B.; Sysoev, V.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 8p. Order Number DE94616951. Source: OSTI; NTIS (US Sales Only); INIS.

By integrating the thermodynamic Gibbs-Tolman-Konig-Buff equation, we derive an expression for the surface tension $\delta(R)$ and demonstrate that the use of its simple asymptotic ($y=R/\delta >>1$) form, $\delta(R)=\delta_\infty(1-2\delta/R)$ is questionable in case of small droplets typical of the deconfinement phase transition. The misuse of the asymptotics affects the existing calculations of the droplet free energy and consequently, the estimated supercooling or superheating of the hot and dense nuclear matter. (author). 7 refs., 2 figs.

13685 (ITP–93-38E) **Matrix elements of potential energy operator for three-cluster channel α + p + n of ^{6}Li.** Filippov, G.F.; Korennov, S.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. Order Number DE94616952. Source: OSTI; NTIS (US Sales Only); INIS.

The matrix elements of potential energy operator between the oscillator basis functions are calculated within the framework of the algebraic version of the resonating group method for the ^{6}Li nucleus considering the latter as a three-cluster system. The consideration scheme is applicable for other nuclei when three-cluster model is used. (author). 4 refs.

13686 (IYaF–92-49) **Cranking model conserving to mean square of angular momentum.** Mazepus, V.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 14p. (In Russian). Order Number DE94616968. Source: OSTI; NTIS (US Sales Only); INIS.

For description of deformed nuclei are investigated the forced rotation models (cranking models). Multiquasiparticle hamiltonians of the ground state of odd and even nuclei and their wave functions are considered. 6 refs.

13687 (JINR-E–2-93-201) **Structure of the neutron-rich lithium isotopes in heavy-ion reactions.** Bespalova, O.V. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Galakhmatova, B.S.; Romanovskij, E.A.; Shitikova, K.V.; Burov, V.V.; Rzyanin, M.V.; Miller, H.G.; Yen, G.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 18p. Order Number DE94618586. Source: OSTI; NTIS (US Sales Only); INIS.

The structure properties, for factors, angular distributions and interaction cross sections of Li neutron-rich isotopes have been analyzed in the unified way. A good qualitative agreement with the experiment data was obtained. 20 refs.; 11 figs.; 1 tab.

13688 (JINR-E–4-93-223) **Vibrational states in deformed nuclei. Chaos, order and individual nature of nuclei.** Soloviev, V.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 20p. Order Number DE94618592. Source: OSTI; NTIS (US Sales Only); INIS.

General properties of the vibrational states in doubly-even well-deformed are formulated. The large many-quasiparticle components of the wave functions of the neutron resonance state are responsible for enhance E1- and M1-transitions rates from the neutron resonances states to the levels lying 1-2 MeV below them. 44 refs.; 4 tabs.

13689 (JINR-E–4-93-238) **Variational description of the rotating nuclei.** Nawrocka, W.; Nazmitdinov, R.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 15p. Order Number DE94618614. Source: OSTI; NTIS (US Sales Only); INIS.

Pairing vibrations in strongly rotating nuclei are treated using the variational approach. The residual interaction is assumed to be due to monopole pairing. 21 ref.

13690 (JINR-R–2-93-160) **Huygens principle and the moving charge field: Maxwell equations.** Shelaev, I.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. 26p. (In Russian). Order Number DE94616928. Source: OSTI; NTIS (US Sales Only); INIS.

Together with a satisfied the extended Hygens principle scalar potential an appropriate vector potential of an arbitrary moving point charge is determined. Composed with the potentials electric and magnetic fields satisfy Maxswell equations and the charge movement generates induced space charges and currents in the around space. A normal electric field component is constant on an equipotential surface and the magnetic field is orthogonal to the electric one in any space point. The absence of wave components in the self field of the moving charge brings a new consideration of the problem of electromagnetic energy radiation. The electric and magnetic fields of an uniformly moving charge may be calculated precisely at any its velocity. The magnetic field of an uniformly charged filament moving with a constant relative velocity β along its proportional to the filament current when $\beta<1$ and is constant for $\beta>1$. The induced space charge causes dependence of effective value of the moving charge on its velocity such that the effective value at $\beta<1$ is finite and is zero when $\beta\geq$. It is presumed that the fact limits the charged particle velocity in accelerators by the value $\beta<1$. 4 refs.; 1 tab.

13691 (JINR-R–6-93-233) **(α–γ)-coincidences in the ^{225}Ac decay.** Gromov, K.Ya. (and others); Kuznetsova, M.Ya.; Norseev, Yu.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 14p. (In Russian). Order Number DE94618593. Source: OSTI; NTIS (US Sales Only); INIS.

Level scheme of ^{221}Fr is developed on the basis of the experimental investigations of gamma-ray spectra coincident with fine structure alpha-lines of ^{225}Ac. 10 refs.; 2 figs.; 1 tab.

13692 (KURRI-TR–377) **Proceedings of the specialist research meeting on the nuclear physics and solid state physics by a radioactive nuclear beam.** Fujioka, Manabu (Tohoku Univ., Sendai (Japan). Cyclotron and Radioisotope Center); Kawase, Yoichi; Okano, Kotoyuki (eds.). Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst. Jun 1993. 99p. (In Japanese). (CONF-9303257–: Specialist research meeting on the nuclear physics and solid state physics by a radioactive nuclear beam, Kumatori (Japan), 23-24 Mar 1993). Order Number DE94748669. Source: OSTI; NTIS; INIS.

By virtue of a great progress in radioactive beam accelerators, new research fields are now developing. In Japan, these new fields are getting particular financial supports in coming years. The solid state physics research with use of radioactive nuclear beams is one of the research projects at KURRI. To discuss these subjects, the specialist research meeting on Nuclear Physics and Solid State Physics with Use of Radioactive Beams was held at Kumatori on March 23 and 24, 1993. Several noticeable investigations on solid state physics related to radioactive beams were presented, together with reports on ion sources and accelerators for radioactive beams developed at INS(Tokyo Univ.), RCNP(Osaka Univ.), CYRIC(Tohoku Univ.) and others. The results of traditional investigations at ISOL facilities were also reported. These clearly indicate the steady growth of research potential in these new fields. The valuable contributions to the meeting are summarized. (J.P.N.).

13693 (LA-UR–94-0386) **The 1992 FRDM mass model and unstable nuclei.** Moeller, P. (Univ., of Aizu, Aizu-Wakamatsu, Fukushima (Japan). Center for Mathematical Sciences); Nix, R.J. Los Alamos National Lab., NM (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931250–1: Structure and reactions of unstable nuclei, Kyoto (Japan), 1-3 Dec 1993). Order Number DE94006159. Source: OSTI; NTIS; INIS; GPO Dep.

We discuss the reliability of a recent global nuclear-structure calculation in regions far from β stability. We focus on the results for nuclear masses, but also mention other results obtained in the nuclear-structure calculation, for example ground-state spins. We discuss what should be some minimal requirements of a nuclear mass model and study how the macroscopic-microscopic method and other nuclear mass models fullfil such basic requirements. We study in particular the reliability of nuclear mass models in regions of nuclei that were not considered in the determination of the model parameters.

13694 (LPCC–92-10) **Formation and decay of hot nuclei.** Tamain, B. Caen Univ., 14 (France). Lab. de Physique Corpusculaire. Sep 1992. 30p. (CONF-9208218–: Predeal International Summer School in Physics on topics in atomic and nuclear collisions, Predeal (Romania), 31 Aug - 11 sep 1992). Order Number DE94618594. Source: OSTI; NTIS (US Sales Only); INIS.

The mechanisms involved in hot nuclei formation and decay and their eventual connexion with fundamental properties of nuclear matter are discussed, i.e. its equation of state is considered. After a brief review of the reactions in which hot nuclei can be formed, the variables which are used to describe them, the corresponding theoretical descriptions and their limits when extreme states are reached are discussed. Experimental evidences for hot nuclei formation are presented, with the corresponding decay properties used as signatures. (R.P.) 64 refs.; 25 figs.; 2 tabs.

13695 (UCRL-ID–116328) **DOE 1994 review of nuclear physics.** Becker, J. Lawrence Livermore National Lab., CA (United States). 8 Feb 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007756. Source: OSTI; NTIS; INIS; GPO Dep.

Understanding the physics of nuclei at the limits of deformation. Superdeformed nuclei (i.e., nuclei with a major-to-minor axis ratio of ~2:1) provide a unique laboratory for nuclear structure studies at the limits of observable deformation. Islands of superdeformation are predicted and found throughout the table of isotopes. We have focused our attention on the A = 190 region, since neutron deficient Hg and Pb nuclei were predicted to support a stable superdeformed minimum at zero angular momentum. We are making major contributions to the development of this region of superdeformation. We find general agreement with fully 3-D Hartree Fock calculations done with a microscopic interaction, including pairing. Our measurements test predictions in the second well which are based on extrapolation of nuclear theory determined at 'normal' deformation. In addition, unusual phenomena are expected because of the large difference in shape between well I and well II states. Our experiments require the sensitivity and resolution of large scale Ge detector arrays.

13696 (UCRL-JC–113392) **Survey of odd-odd deformed nuclear spectroscopy.** Hoff, R.W. Lawrence Livermore National Lab., CA (United States). 14 Sep 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309173–9: 8. symposium on capture gamma-ray spectroscopy and related topics, Fribourg (Switzerland), 20-24 Sep 1993). Order Number DE94007080. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper, we survey the current experimental data that support assignment of rotational bands in odd-odd deformed nuclear in the rare earth and actinide regions. We present the results of a new study of ^{170}Mt nuclear structure. In a comparing experimental and calculated Gallagher-Moszkowski matrix elements for rare earth-region nuclei, we have developed a new approach to the systematics of these matrix elements.

6632 Radioactivity and Electromagnetic Transitions (Excluding Fission)

Refer also to citation(s) 13680, 13692

13697 (ITF–93-4R) **The interpretation of Palumbo's model using of microscopic basis functions SU_3 x SU_3.** Filippov, G.F.; Dotsenko, I.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 19p. (In Russian). Order Number DE94616983. Source: OSTI; NTIS (US Sales Only); INIS.

The Palumbo's nuclear model of two axial rotators is interpreted as a generalization of Elliot's model SU_3. The Elliot's basis is expanded up to the basis of the direct production SU_3 x SU_3. The generators of the neutron and proton subsystems are written as well as the generators for the system of all valence nucleons of the nuclei as a whole. Kazimir's operator of the second order for SU_3 is obtained and its explicit eigenfunctions are found. The operators of the isoscalar and isovector (electric quadrupole and magnetic dipole) transitions are expressed through the group generators. Somewhere it will be shown that the above developed method permits to find the probabilities of isovector M 1 and E 2 transitions without an additional phenomenological parameters. (author). 14 refs.

13698 (ITF–93-17R) **The calculation of isoscalar and isovector electromagnetic transitions probabilities in nucleus with opened shells based on the model SU_3 x SU_3.** Filipov, G.F.; Dotsenko, I.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 20p. (In Russian). Order Number DE94616981. Source: OSTI; NTIS (US Sales Only); INIS.

On the base of microscopic functions of the SU_3 x SU_3 basis the matrix elements of the operators of electromagnetic transitions, the reduced probabilities and isoscalar and isovector transitions probabilities per unit time between the nuclear states with quantum numbers (λ, μ)=(2 n,0) and (λ,μ)=(2 n-2,1) are calculated. The calculated values of the transition probabilities and the levels width for the nucleus ^{8} Be and ^{20}Ne are compared with the experimental obtained values. The degree of coincidence of calculated and observed values of transition probabilities (or levels width) allows to obtain some information concerning the nature of the exited nuclear states. (author). 9 refs., 4 tabs.

13699 (ITF–93-27R) **The construction of the wave functions of nuclear states in microscopical two axial rotators model.** Filippov, G.F.; Dotsenko, I.S. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 19p. (In Russian). Order Number DE94616982. Source: OSTI; NTIS (US Sales Only); INIS.

The technique with allows to construct wave functions of the microscopic model of two axial rotators in the Fock-Bargman space is considered in detail. The part of the set of wave functions obtained here was previously employed by the authors to calculate the isoscalar and isovector electromagnetic transitions in $_{4}^{8}$ Be, $_{10}^{20}$ Ne, $_{22}^{44}$ Ti. (author). 14 refs., 2 tabs.

13700 (JINR–6-92-57, pp. 32-38) **On beta decay of the isotope ^{183}Tl produced by the ^{147}Sm + ^{40}Ca reaction.** Bouldzheri, A. (and others); Bero, R.; Dyuffe, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

Beta decay of the ground state of a very neutron-deficient isotope ^{183}Tl was investigated. The ^{183}Tl was produced via the ^{147}Sm(^{40}Ca,p3n) reaction on the SARA cyclotron at ISN, Grenoble. Gamma lines resulting from the de-excitation of ^{183}Hg levels were observed and the half-life of ^{183}Tl was determined to be 5±2 s. The khown isotope ^{184}Tl also produced and clearly identified in these experiments. 28 refs.; 2 figs.

6633 Nuclear Reactions and Scattering, General

Refer also to citation(s) 13352, 13476

13701 (BARC–1993/P/006) **Nuclear Physics Division annual report 1992.** Betigeri, M.G. (ed.) (Bhabha Atomic Research Centre, Bombay (India). Nuclear Physics Div.). Bhabha Atomic Research Centre, Bombay (India). 1993. 134p. Order Number DE94616988. Source: OSTI; NTIS (US Sales Only); INIS.

The report covers the research and development activities of the Nuclear Physics Division for the period January to December 1992. These research and development activities are reported under the headings: (1) Experiments, (2) Theory, (3) Applications, (4) Instrumentation, and (5) The Pelletron Accelerator. At the end a list of publications by the staff scientists of the Division is given. Colloquia and seminars held during the year are also listed. (author). refs., tabs., figs.

13702 (INIS-BR–3259) **Isomeric rations study for the α + ^{70} Ge.** Hora Villano, M.H. da. Universidade Federal, Rio de Janeiro, RJ (Brazil). Inst. de Fisica. Dec 1984. 107p. (In Portuguese). Order Number DE94618640. Source: OSTI; NTIS (US Sales Only); INIS.

Isomeric ratios for ^{73} Se^{F,I} produced in the reaction α + ^{70} Ge with incidence laboratory energy ranging from 8 to 28 MeV, have been measured using off-line γ-ray spectroscopy. Relative formation cross-section for isomeric and ground states were obtained with ^{NAT} Ge targets. Compound nucleus statistical analyses were performed using computer codes Alice and Julian. Unlike to Alice code, the Julian code predictions agreed quite well with the experimental results. This agreement may be explained by the inclusion of the γ competition in the deexcitation channels of the compound nucleus and by the correct level density calculation of the emission probabilities in the Julian code. Finally angular momentum populations for isomers formations in the reaction ^{70} Ge(α, n)^{73} have been determined. (author).

13703 (IPNO-DRE–93-03) **Decay modes of high-lying excitations in nuclei: Probing the microscopic structure or the statistical model.** Gales, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 15p. Order Number DE94618641. Source: OSTI; NTIS (US Sales Only); INIS.

Inelastic, charge-exchange and transfer reactions induced by hadronic probes at intermediate energies have revealed a rich spectrum of new high-lying modes embedded in the nuclear continuum. The investigation of their decay properties is believed to be a severe test of their microscopic structure as predicted by nuclear models. In addition the degree of damping of these simple modes in the nuclear continuum can be obtained by means of the measured branching ratios to the various decay channels as compared to statistical model calculations. As illustrative examples the decay modes of high-spin single-particle states and isovector resonances are discussed. (author) 23 refs.; 14 figs.

13704 (IPNO-DRE–93-07) **The giant dipole resonance in very hot nuclei studied with the MEDEA detector.** Le Faou, J.H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Suomijaervi, T.; Blumenfeld, Y.; Piattelli, P.; Agodi, C.; Alba, R.; Alamanos, N.; Auger, F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 12p. (CONF-9301126–: International winter meeting on nuclear physics, Bormio (Italy), 31 Jan 1993). Order Number DE94618642. Source: OSTI; NTIS (US Sales Only); INIS.

The characteristics of the Giant Dipole Resonance in hot nuclei formed by incomplete fusion of ^{36}Ar + ^{90}Zr at 27 MeV/u were measured at GANIL with the MEDEA detector. This set-up allows the simultaneous measurement of γ rays, light charged particles, and fusion residues. Preliminary results indicate that the giant dipole resonance shows up prominently in coincidence with the incomplete fusion residues which have a mean excitation energy of 550 MeV. By dividing the data into different momentum transfer bins, indications for the saturation with increasing excitation energy of the gamma multiplicity from Giant Dipole Resonance decay are obtained. (author) 27 refs.; 5 figs.; 2 tabs.

13705 (IPNO-DRE–93-08) **Investigations of the neutron halo by radioactive beam experiments.** Mueller, A.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 13p. (CONF-9301126–: International winter meeting on nuclear physics, Bormio (Italy), 31 Jan 1993). Order Number DE94618643. Source: OSTI; NTIS (US Sales Only); INIS.

Recently, a new tool has become available to study the behaviour of nuclei at the limits of particle stability. Heavy-ion projectile fragmentation, in combination with efficient recoil spectrometers, allows to prepare 'exotic' beams which can be used to induce secondary nuclear reactions. First experiments have revealed surprising features in the reactions of the most neutron-rich light nuclei. There is now conclusive evidence that the observed effects are due to long-tail matter distributions ('neutron halo') which occur for the last, very weakly bound neutrons. The results of some recent radioactive beam experiments, made by means of the spectrometer LISE3 at GANIL, are presented. (author) 24 refs.; 7 figs.

13706 (IPNO-DRE–93-10) **Nuclei at the limits of particle stability.** Mueller, A.C. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Sherrill, B.M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 86p. (MSU-CL–883.). Order Number DE94618644. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Annual Review of Nuclear and Particle Sciences (US).

The properties and synthesis of nuclei at the limits of particle stability are reviewed. Nuclear reactions were induced and studied by means of the 'exotic' nuclear beams, i.e. beams of radioactive drip-line nuclei. The beams are mostly generated in heavy-ion projectile fragmentation. The cases of both neutron-rich and proton-rich nuclei are discussed. (K.A.) 270 refs.; 13 figs.; 1 tab.

13707 (ITF–92-11U) **Effect of meson exchange currents on the electrodisintegration of ^{12} C nuclei.** Kozlovs'kij, Yu. V.; Malyarzh, O.M.; Tartakovs'kij, V.K. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 9p. (In Ukrainian). Order Number DE94616989. Source: OSTI; NTIS (US Sales Only); INIS.

The paper is devoted to the study of meson exchange current (MEC) influence on the ^{12} C electrodisintegration cross-section. The MEC are taken into account by the method of unitary transformation. Their effect on the distribution shape is shown to be weak about the maxima and considerable in the minima and on the tails. In some cases taking MEC into account improves the agreement with the experimental data. (author). 6 refs., 3 figs.

13708 (ITF–92-23R) **Microscopic study of the quadrupole resonance in α-^{16}O scattering.** Bystrenko, A.V.; Okhrimenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 21p. (In Russian). Order Number DE94616990. Source: OSTI; NTIS (US Sales Only); INIS.

The resonance states in continuous spectrum of ^{20}Ne in energy region under 30 MeV are investigated. The calculation were carried out using the consistent microscopic approach (algebraic version of the resonating group method) taking into account both α+^{16}O-cluster and collective quadrupole channels. It is shown that the additional even rotational bands of quadrupole resonances as result of taking into account of quadrupole mode in region above 10 MeV appear. The nuclear width of quadrupole excitations of ^{20} Ne are estimated. (author). 17 refs.

13709 (ITF–92-43R) **Photoproduction of tensor mesons on protons.** Struminskij, B.V.; Shelkovenko, A.N. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 5p. (In Russian). Order Number DE94616991. Source: OSTI; NTIS (US Sales Only); INIS.

The odderon contribution to the tensor meson photoproduction is investigated. We found strong dependence of the cross-section on polarization of γ-quaint the T-meson. The process can be investigated using the ep collider HERA. (author). 9 refs.

13710 (ITF–92-48U) **On the nucleon radiative capture by deuterons.** Kozlovs'kij, Yi. V.; Malyarzh, O.M.; Tartakovs'kij, V.K. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 12p. (In Ukrainian). Order Number DE94616992. Source: OSTI; NTIS (US Sales Only); INIS.

Low-energy nucleon-deuteron radiative capture cross sections are calculated as functions of the photon escape angle. The results are in satisfactory agreement with available experimental data for certain incident particle energies. (author). 4 refs., 3 figs.

13711 (ITP–93-24E) **Three-body theory of the effective interaction between a particle and a two-particle bound system.** Kharchenko, V.F.; Shadchin, S.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 28p. Order Number DE94616993. Source: OSTI; NTIS (US Sales Only); INIS.

Based on the Francis-Watson definition and the Faddeev integral-equation method, the three-body formalism of the effective interaction between a particle and a two-particle bound system has been developed. As an example, a three-body model with interaction chosen in the form of the sum of two pair potentials (namely a short-range (separable) potential and the Coulomb one) is considered. A new non-perturbative three-body method for studying asymptotic behaviour of the polarization potential at large distances of a particle to a two-particle complex is suggested. The formula for the electric dipole polarizability of the two-particle system is derived. (author). 23 refs.

13712 (JINR–3-93-60, pp. 40-51) **Experimental study of multiplicity dependence of cumulative pion production in fragmentation of relativistic deuterons and carbon nuclei.** Afanasiev, S.V. (and others); Anisimov, Y.S.; Bondarev, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

4.5 x A GeV/c deuteron and carbon nucleus fragmentation into cumulative pions fas been measured on various target nuclei in the range of the scale variable within 0.6-1.6 corresponding to the region around the kinematical limit of free nucleon-nucleon collisions. The target nucleus atomic weight dependence significantly differs from the volume type dependence on the atomic weight previously established for a fragmenting nucleus. A weak multiplicity dependence of the target nucleus fragmentation supports the limiting fragmentation picture of the process. The investigation hes been performed at the Laboratory of High Energies, JINR. 13 refs., 11 figs.

13713 (JINR–3-93-60, pp. 52-67) **Experiments on relativistic nuclear physics in beams of Dubna synchrophasotron and nuclotron.** Baldin, A.M.; Malakhov, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The program of the experiments on relativistic nuclear physics at the Dubna Synchrophasotron and the new superconducting accelerator Nuclotron, is reviewed. The main goal of the experiments is the study of the manifestation of the quark-gluon degrees of freedom in nuclei. The beam energies of both accelerators exceed the energy at which the asymptotic regime sets (0.3-4.5 A GeV). It makes possible to study practically all the characteristics of strongly excited nuclear matter. The project of the SPHERE 4π spectrometer, at which the first results have been obtained, is given in more detail. The investigation has been performed at the Laboratory of High Energy, JINR. 11 refs., 10 figs., 2 tabs.

13714 (JINR-R–2-93-246) **Interference pair correlations of γ-quanta with slightly different momenta in the model of dipole sources.** Lyuboshits, V.L.; Podgoretskij, M.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1993. 23p. (In Russian). Order Number DE94618645. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yad. Fiz.

The problem of the pair correlations of γ-quanta generated by an intermediate compound-system which arises in nuclear collisions with energies below the threshold of π^0-meson production, is considered. It is shown that under these conditions it is resonable to use the model of independent dipole sources with the purpose of the adequate description of $\gamma\gamma$-correlations of two unpolarized photons with their transversality taken into account. 12 refs.

13715 (NIIYaF-MGU–92-40-289) **Program of calculation of correlation characteristics of nuclear reactions in statistical model.** Belyaeva, T.L.; Bogdanova, N.A.; Zelenskaya, N.S.; Odintsov, N.V. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 50p. (In Russian). Order Number DE94616994. Source: OSTI; NTIS (US Sales Only); INIS.

A program is considered for computation of different characteristics of nuclear reactions with production of a compound nucleus. As a method for computation is used the formalism of the spin density matrix. Computation of the spin-tensors of the density matrix permits to determine the characteristics both of excited nucleus states and of nuclear reactions, namely: population of magnetic sublevels of an excited nucleus and the angular correlation function for final particles. 37 refs., 10 figs., 3 tabs.

13716 (PCCF-RI–93-08, pp. 2-4) **Description of heavy ion reactions.** Cugnon, J. (Liege Univ. (Belgium). Inst. de Physique). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. Contract SPPS-IT/SC/29. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A brief account is given of nuclear reactions between nuclei or heavy ions as an important process of heavy ion transport in material. Various reaction mechanisms in the energy range from 10 MeV/u to 2 GeV/u are discussed, including complete fusion, deep inelastic collision, massive transfer, fragmentation, multifragmentation and participant-spectators. (R.P.) 6 refs.; 1 fig.

13717 (PCCF-RI–93-08, pp. 5-7) **Nuclear fragmentation and applications to biology and space physics.** Alard, J.P. (Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire). Diogene and FOPI Collaborations. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Relativistic Heavy Ion Collisions (RHIC) present a great interest in the field of radiobiology, medicine and space, since relativistic heavy ions undergo in matter both electromagnetic interactions, and nuclear interactions which result principally in the fragmentation of the projectile and target nuclei. A brief description of two experimental setups is presented which permits the realization of fragmentation experiments. The DIOGENE experiment consists of a cylindrical time projection chamber (TPC) permitting identification of particles and light fragments (up to Z=6) emitted in the angular range 25 to 140 degrees. The FOPI experiment consists of two parts: the analysis of fragments of charge up to Z=20, emitted in

the angular range 1 to 30 degrees, and the analysis of light particles (pions, protons and fragments up to α particles) with a central TPC. (R.P.) 3 refs.; 3 figs.

13718 (PCCF-RI–93-08, pp. 47-48) **Nuclear fragmentation and the space radiation problem.** Miller, J. (Lawrence Berkeley Lab., CA (United States)); Frankel, K.; Gong, W.; Heilbronn, L.; Zeitlin, C.; Schimmerling, W.; Shavers, M.R.; Townsend, L.W.; Wilson, J.W. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A very brief description of some heavy ion fragmentation results from the LBL Bevalac is presented. The program was originally begun in support of the Bevalac heavy ion radiotherapy program, and in recent years the applications to space radiation risk assessment have also become apparent. $^{20}Ne + H_2O$, ^{56}Fe + polyethylene and ^{93}Nb + Nb,Al fragments are considered. (R.P.) 9 refs.; 4 figs.

13719 (PCCF-RI–93-08, pp. 53-54) **Interactions of 1.3 GeV/nucl ^{84}Kr nuclei in emulsions.** Just, L. (Slovenska Akademia Vied, Kosice (Slovakia). Ustav Experimentalnej Fyziky); Karabova, M.; Kudela, K. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Basic experimental data are presented on the mean free path, parameter of fragmentation and on angular distribution in the interactions of ^{84}Kr nuclei of 1.3 GeV/nucl. The mean free path for the inelastic collisions ^{84}Kr+Em obtained is in good agreement with earlier published data on exposure of emulsions by ions. The increase of number of fragments with increasing mass of primary nucleus is observed. (R.P.) 9 refs.; 2 figs.; 2 tabs.

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Refer also to citation(s) 12733, 12942, 13492, 13527, 13528, 13550, 13676, 13679, 13680, 13694, 13700, 13701, 13704, 13943

13720 (BNL–49875) **Negative binomial fits to multiplicity distributions in restricted $\delta\eta$ intervals from central O+Cu collisions at 14.6A GeV/c and their implication for "intermittency".** Tannenbaum, M.J. (Brookhaven National Lab., Upton, NY (United States)); Kang, J. E802 Collaboration. Brookhaven National Lab., Upton, NY (United States). [1993]. 6p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9309297–7: 23. international symposium on multiparticle dynamics, Aspen, CO (United States), 13-17 Sep 1993). Order Number DE94007173. Source: OSTI; NTIS; INIS; GPO Dep.

Fluctuations in pseudorapidity of charged particle multiplicity from central (ZCAL) collisions of ^{16}O+Cu at 14.6 A·GeV/c have been analyzed by the E802 Collaboration using the method of normalized factorial moments as a function of the interval $\delta\eta$. In agreement with previous measurements, an apparent power-law growth of moments with decreasing interval is observed down to $\delta\eta \sim 0.1$. Experience with E_T distributions suggests that fluctuations of multiplicity and transverse energy can be well described by Gamma or Negative Binomial Distributions (NBD) and excellent fits to NBD were obtained in all $\delta\eta$ bins. The κ parameter of the NBD fit was found to increase linearly with the $\delta\eta$ interval, which due to the well known property of the NBD under convolution, indicates that the multiplicity distributions in adjacent bins of pseudorapidity $\delta\eta \sim 0.1$ are largely statistically independent.

13721 (BNL–49938) **Compression, expansion, and freeze-out in nucleus-nucleus collisions at the AGS.** Braun-Munzinger, P. (State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics). E814/E877 Collaboration. Brookhaven National Lab., Upton, NY (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930999–7: NATO Advanced Study Institute on hot and dense nuclear matter, Bodrum (Turkey), 26 Sep - 9 oct 1993). Order Number DE94007162. Source: OSTI; NTIS; INIS; GPO Dep.

In the following we will present selected aspects of recent data on central nucleus-nucleus collisions taken by the E814/E877 collaboration at the BNL-AGS. We will first demonstrate that stopping is nearly complete in these collisions, and discuss the initial energy and baryon densities inferred from model comparisons with the data. Next we will discuss the amount of expansion the system undergoes from the initial phase until freeze-out by presenting recent results on pion-pion correlations. The (baryonic) resonance composition of the system at freeze-out is obtained by analyzing pion spectra at low transverse momentum p_t and by inspection of direct measurements of the $\Delta(1232)$ resonance. Based on analysis of these measurements we will then discuss a "local" freeze-out scenario, where the freeze-out volume is connected with the temperature averaged pion-nucleon cross section. A summary of the current results and of future plans for Au-Au collisions with the E877 apparatus concludes the paper. The data presented were obtained for central 14.6 A GeV/c Si + Al and Si + Pb collisions and 11.4 A GeV/c Au+Au collisions. The forward spectrometer covers in one fixed setting an angular range in the magnet bend plane of $-115 < \theta_x < 14$ mr and $-21 < \theta_y < 21$ mr perpendicular to it. Centrality is selected by measuring associated charged particle multiplicity and/or transverse energy.

13722 (BNL–49968) **Transverse energy production with Si and Au beams at AGS energy: Towards hot and dense hadronic matter.** Barrette, J. (McGill Univ., Montreal, PQ (Canada). Foster Radiation Lab.). E814/E877 Collaboration. Brookhaven National Lab., Upton, NY (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930636–12: 10. international conference on ultra-relativistic nucleus-nucleus collisions, Borlaenge (Sweden), 20-24 Jun 1993). Order Number DE94007178. Source: OSTI; NTIS; INIS; GPO Dep.

One of the main goals of the present heavy-ion reaction studies at the AGS and CERN is the understanding of the space-time evolution of the particle and energy density produced in such collisions. These are necessary ingredients if one wants to understand quantitatively the properties of matter at high temperature and density. In that respect, the study of inclusive global variables such as the transverse energy distribution gives valuable information on the reaction dynamics and, albeit indirectly, on the energy and baryon density reached in nucleus-nucleus collisions. In the spring of 1992, the AGS produced the first beam of very heavy ions, more specifically a beam of 11.4 GeV/c per nucleon ^{197}Au. This is an important step for the field since it gives a first glimpse as to how the reaction dynamics evolves as the mass and volume of colliding systems reach the largest value that will be available in the future. The authors have used part of the E814 experimental set-up to study the transverse energy distribution produced in Au induced collisions. These data can be compared to similar data obtained with lighter beams and thus provide for the first time information on how the E_T distribution evolves with the mass of the system as one reaches very large systems.

13723 (BNL–49969) **Particle production in p+A collisions at 14.6 GeV/c.** Rosati, M. (McGill Univ., Montreal, PQ (Canada). Foster Radiation Lab.). E814 Collaboration. Brookhaven National Lab., Upton, NY (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930636–13: 10. international conference on ultra-relativistic nucleus-nucleus collisions, Borlaenge (Sweden), 20-24 Jun 1993). Order Number DE94007174. Source: OSTI; NTIS; INIS; GPO Dep.

In the last few years, studies of heavy-ion collisions at high energy have produced new insight into the production of nuclear matter at high baryon density and temperature. While heavy-ion reactions at AGS energy are now well characterized, to clarify and test our understanding of the reaction mechanism of these collisions it is important to study the underlying processes involved. The study of p-A collisions should be particularly useful to understand in which way A-A collisions differ from the simple superposition of nucleon-nucleon collisions and it may be a specially

severe test of the validity of the models in describing the transition from a single collision problem to a thermodynamic problem mainly defined by a few observables. In particular, p-A collisions should be sensitive to the way nucleons propagate in the nuclear medium and thus provide more insight on: the importance of rescattering, the stopping power of normal nuclear matter, and possibly on the influence of the nuclear matter density and temperature on the hadronic cross sections. In this paper we present the transverse energy and charged particle multiplicity distributions in proton induced collisions on Al, and Pb targets at 14.6GeV/c. These data have been obtained as part of the E814 collaboration and are thus immediately comparable to similar data obtained for ^{28}Si and Au induced reactions at the same energy.

13724 (BNL–52389, pp. 10-15) **Evidence for observation of color transparency in proton nucleus collisions.** Jain, P. (Univ. of Kansas, Lawrence, KS (United States)); Ralston, J.P. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The authors introduce a data procedure for color transparency experiments which is considerably less model dependent than the transparency ratio method. The new method is based on fitting the shape of the A dependence of the nuclear cross section at fixed momentum transfer to determine the effective attenuation cross section for hadrons propagating through the nucleus. The hard scattering cross section is then determined directly from the data. The authors apply this procedure to the Brookhaven experiment of Carroll et al and find that it clearly shows color transparency: the effective attenuation cross section in events with momentum transfer Q^2 is approximately 40 mb (2.2 GeV^2/Q^2). The fit to the data also supports the idea that the hard scattering inside the nuclear medium is closer to perturbative QCD predictions than is the scattering of isolated protons in free space. The authors discuss the application of their approach to electroproduction experiments.

13725 (BNL–52389, pp. 16-22) **Looking for color transparency: Why and where.** Strikman, M. (Pennsylvania State Univ., University Park, PA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

It is argued that measuring color transparency effects is feasible in a wide class of reactions. Such measurements will provide promising new methods for investigating correlations of partons in hadron wave functions, the transition from non-perturbative to perturbative QCD as well as microscopic nuclear structure. A number of promising reactions is discussed.

13726 (BNL–52389, pp. 23-28) **Relative $\bar{q}(x)$ distribution in nucleons and nuclei.** Garvey, G.T. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This paper is a brief report on research done by E-772 at FNAL using the Drell-Yan Process in a particular kinematic arrangement to investigate the relative sea quark content of nuclei and nucleons. The relative A dependence in nuclei shows very little change (< 1.5%) out to the heaviest nuclei. Shadowing is observed to increase as a function of A at a level consistent with that observed in deep inelastic scattering.

13727 (BNL–52389, pp. 35-46) **Some outstanding issues in pion scattering at energies above the δ resonance.** Morris, C.L. (Los Alamos National Lab., NM (United States)); Zumbro, J.D. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The $\Delta(1232)$ resonance dominates pion-nucleon scattering at energies below 300 MeV, the region in which pion nucleus scattering has been well studied using spectrometers at the meson factories. Above this energy region little pion-nucleus scattering data exists. Recently, spectrometers at Brookhaven, LAMPF, KEK, and DUBNA have been used to obtain initial data for pion nucleus scattering in this energy region. In this talk the authors review some data that have been obtained using the LAS spectrometer at LAMPF.

13728 (BNL–52389, pp. 47-52) **Dynamics of pion-nucleus systems.** Johnson, M.B. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The prospects for using high-energy pions to examine modifications of baryon resonances in nuclei, nuclear structure, exchange currents, short-range correlations, and to characterize pion propagation are discussed.

13729 (BNL–52389, pp. 53-59) **Quasifree $(\vec{p}, \vec{n})$ reactions and enhancement of pionic processes.** McClelland, J.B. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Results from a complete set of polarization-transfer observables for quasifree $(\vec{p}, \vec{n})$ scattering at 495 MeV are reported. Measurements were carried out on CD_2, carbon, and calcium targets at a laboratory scattering angle of 18° using the new Neutron Time-of-Flight facility at LAMPF. The ratio of spin-longitudinal to spin-transverse responses at a momentum transfer of approximately 1.72 fm^{-1} is extracted from the data, as well as the separated responses, and compared to distorted-wave calculations incorporating a Random-Phase Approximation description of the nuclear response. The spin-transverse response is compared to (e, e') measurements. The spin-longitudinal response represents new information available from hadron scattering.

13730 (BNL–52389, pp. 68-73) **Atomic mass dependence of $D^{\pm}$ and D^0, $\bar{D}^0$ production in 250 GeV $\pi^{\pm}$-nucleon interactions.** Alves, G.A. (Laboratorio de Fisica Experimental de Altas Energias, Rio de Janeiro (Brazil)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The author measures the relative cross sections for D-mesons produced in interactions of π^- and π^+ beams with targets of Be, Cu, Al, and W. The measurement is based on 1400 fully reconstructed decays of the types $D^0 \rightarrow K^-\pi^+$, $D^+ \rightarrow K^-\pi^+\pi^+$, and charge conjugates. It is found that the cross section for the production of both neutral and charged D's by either π^- or π^+ is well fit by the form A^{α} where A is the atomic mass and $\alpha = 1.00 \pm 0.05 \pm 0.02$, where the errors are statistical and systematic, respectively. There is no significant dependence of α on the transverse or longitudinal momentum of the D-meson or on the charge of either the incident pion or the produced D-meson.

13731 (BNL–52389, pp. 93-96) **Structure functions: 1995-2005.** Bolton, T. (Columbia Univ., New York, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at*

multi-GeV hadron beam facilities. 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This contribution will briefly discuss the state of measurements of nucleon structure using leptonic probes and the prospects for extending and improving these measurements. Since the discussion will be brief, four restrictions will be followed: Only deep inelastic scattering will be discussed, i.e., $\sqrt{Q^2}$, $\nu \geq 3$ GeV or so. Only scattering off unpolarized targets will be considered (spin effects are covered elsewhere in this conference). No attention will be given to nuclear effects. And finally, no attempt will be made to systematically review the considerable quantity of recently published and soon-to-be published experimental results.

13732 (BNL–52389, pp. 189-193) **Some highlights of the SMC 1992 data acquisition run.** Igo, G. (Univ. of California, Los Angeles, CA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

In 1992, the SMC obtained data to determine the deuteron spin structure function, g_1^d. A significant enhancement in the rate of polarization growths and the polarizations of twin targets, from 24% to more than 40%, was obtained. The technique involves the modulation of the ESR frequency. Thirty percent of the deuteron data (40% equivalent polarization) was obtained by the end of the 1992 run. A muon polarimeter, commissioned during the 1991 run, provided a measurement of the beam polarization, 82 ±6%.

13733 (BNL–52389, pp. 194-199) **Measurement of the spin structure of the nucleon at HERA.** Milner, R.G. (Massachusetts Institute of Technology, Cambridge, MA (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. DOE Contract W-31-109-ENG-38. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

HERMES is an experiment under construction by a large international collaboration to study the spin structure of the nucleon at DESY, Hamburg, Germany. The structure functions of the proton and neutron will be determined by a completely new technique using polarized internal gas targets of hydrogen, deuterium, and ^{3}He and the longitudinally polarized 30-35 GeV electron beam of the HERA electron storage ring. It is anticipated that the first data will be taken in 1995.

13734 (BNL–52389, pp. 200-205) **Measuring the spin-dependent neutron structure function at SLAC: Status report.** Holmes, R. (Syracuse Univ., NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

This is a report on the status of SLAC experiment E142, a measurement of the spin structure function of the neutron, $g^n_1(x)$, in the range $0.03 < x < 0.6$ and $1 < Q^2 < 6$ GeV^2. The authors took data with polarized electrons scattering from a polarized ^{3}He target in November and December of 1992.

13735 (BNL–52389, pp. 206-211) **The isoscalar axial vector form factor of the proton.** Garvey, G.T. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The violation of the Ellis-Jaffe Sum Rule observed by the EMC has raised significant issues on the role of strange quarks in the nucleon and the total spin projection. The neutral weak axial vector form factor of the nucleon is directly sensitive to isosinglet contributions to the nucleon spin. This form factor is measurable in neutrino-nucleon elastic scattering. It does not require the use of the SU(3) symmetry to extract the isosinglet contribution nor is any extrapolation to x = 0 required. The authors show that the ratio of the yield of (ν,p) to (ν,n) from an isoscalar target yields an accurate value for the isosinglet axial vector form factor that is rather insensitive to the neutrino flux. The authors have reanalyzed the experimental results of E-734 AGS and find that there are appreciable uncertainties that can be remedied in a future experiment. The data do, however, allow a strong constraint on the sum of the strange vector form factors $|F_1^s(Q^2) + F_2^s(Q^2)|$ in the range $.5 < Q^2 < 1.0$ GeV^2.

13736 (BNL–52389, pp. 254-257) **Polarization and color transparency.** Bunce, G. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Color transparency offers an interesting experimental test of the understanding of hadronic polarization effects which have been seen at high energy. Large polarization effects have been seen for exclusive high momentum transfer reactions which are incompatible with lowest order pQCD. It is proposed to filter these reactions by scattering inside a nucleus. The authors expect that only color transparent hadrons would survive, and that these should be products of "hard" scattering. If the polarization arises from a non-perturbative "soft" effect, the nucleus should filter these reaction products away. The authors should see no polarization remaining after the reaction is filtered away by a large nucleus.

13737 (BNL–52389, pp. 258-263) **Pions on polarized nuclei.** Boschitz, E.T. (Universitaet Karlsruhe (Germany)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

New experimental results are presented on the interaction of pions with polarized nuclei of mass A = 2,3,6,7,13 and 15. The data are compared with theoretical calculations. An outlook is given on future perspectives of this field of research.

13738 (BNL–52389, pp. 328-334) **Hypernuclear physics with a neutral meson spectrometer.** Peng, J.C. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The (K^-, π^o) reaction, which complements the (K^-, π^-) and the (π^+, K^+) reactions, offers another means to study hypernuclear physics. The physics motivation for measuring the (K^-, π^o) reaction is discussed. The feasibility for detecting π^o using the LAMPF Neutral Meson Spectrometer is studied with Monte-Carlo simulations. The author concludes that the (K^-, π^o) reaction can be well measured at existing kaon beam lines.

13739 (BNL–52389, pp. 346-348) **Nuclear response to quasielastic k$^+$ scattering.** Peterson, R.J.; Kormanyos, C.; Wise, J.E.; Bart, S.; Chrien, R.E.; Lee, L.; Clausen, B.L.; Barakat, M.B.; Kishimoto, T.; Michael, R. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Quasielastic scattering of 720 MeV/c K$^+$ from deuterium, carbon, calcium, and lead has been measured at 3-momentum transfers of 300, 400, and 500 MeV/c. Well-defined peaks tracking with free scattering are found as the signature of incoherent scattering at 500 MeV/c, while strong effects of nuclear correlations are seen at 300 MeV/c.

13740 (BNL–52389, pp. 360-367) **Doubly-strange systems and hyperon-nucleon scattering at KEK.** Takeutchi, F. (Kyoto Sangyo Univ. (Japan)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Three experiments recently carried out at KEK are presented. The first of the three experiments the author would like to introduce to the reader, E176, is almost completed. Still the analysis is going on, but some of the physical results are already published. For the other experiments, E224 and E251, the data taking is finished, but the author still needs a lot of analysis work before physical results are obtained. Therefore, the author would like to spend most of the space for the description of E176, and at the end, mention briefly about the other experiments.

13741 (BNL–52389, pp. 368-373) **Polarization and weak decay of Λ hypernuclei.** Kishimoto, T. (Osaka Univ. (Japan)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

In the recent experiment the authors have produced polarized hypernuclei and studied weak and strong Λ nucleon interaction in a nucleus. The $^{12}C(\pi^+, K^+)$ reaction was used to produce polarized Λ hypernuclei. Asymmetries of weak decay particles were measured. Polarization of Λ produced by the quasifree process was derived. The polarization is shown to be consistent with that of the elementary $n(\pi^+, K^+)\Lambda$ reaction which demonstrates that the spin characteristics of the elementary reaction is not modified by the nuclear medium. The authors have observed asymmetry of protons from the nonmesonic decay. The large asymmetry parameter (~ -1) of the non-mesonic decay demonstrates the existence of the interference between parity changing and parity conserving amplitudes in the strangeness changing baryon baryon interaction for the first time. The large asymmetry parameter, whose accuracy will be improved by the coming experiment, will elucidate the non-mesonic decay mechanism and open a new field of hypernuclear physics.

13742 (BNL–52389, pp. 374-379) **Hypernuclear studies at DAΦNE.** Agnello, M. (INFN, Torino (Italy)); Iazzi, F.; Minetti, B.; Belli, G.; Corradini, M.; Donzella, A.; Rizzini, E.L.; Venturelli, L.; Bonazzola, G.C.; Botta, E.; Bressani, T.; Calvo, D.; Costa, S.; D'Isep, F.; Feliciello, A.; Filippi, A.; Gianotti, P.; MarcelBrookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The unique properties of kaons at DAΦNE and the expected performances of the experimental apparatus (momentum resolution of 0.2% FWHM and dedicated triggers) will allow an unprecedented step forward precision and high statistics measurements of Λ hypernuclei. The initial physics program is focused on the spectroscopy and decay modes of Λ-hypernuclei, which are produced following the tagged K^- stopped in nuclear targets. At $L = 10^{32}$ cm^{-2} s^{-1} the authors expect to produce and carefully study about 20 hypernuclei, most of them never studied before. The puzzling situation regarding the validity of the $\delta I = 1/2$ rule for non-mesonic decays of hypernuclei will be hopefully clarified.

13743 (BNL–52389, pp. 395-400) **Studies with polarized hypernuclei with pion and kaon beams.** Olin, A. (TRIUMF, Vancouver, British Columbia (Canada)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Investigation of the properties of hypernuclei using their spin observables is a natural extension of present studies. An important production mechanism would utilize the (K^-, π^-) reaction at 1-1.5 GeV. The techniques and facilities required to determine hypernuclear magnetic moments at an intense hadron beam facility are discussed.

13744 (BNL–52389, pp. 504-509) **Production of η mesons near threshold.** Wilkin, C. (Univ. College, London (United Kingdom)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

It is argued that the strong energy dependence of the $pd \rightarrow {}^3He\eta$ cross section near threshold is due to a final state interaction between the η meson and the ^{3}He nucleus. The large scattering length that this implies is in accord with optical potential predictions and is evidence for a nearby virtual "bound" state in the η^3He system. This model suggests that sharp structures should also be seen close to production thresholds on other light nuclei.

13745 (BNL–52389, pp. 510-516) **Nuclear η production.** Londergan, J.T. (Indiana Univ., Bloomington, IN (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. Contract NSF-PHY91-08036. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Nuclear η production has been studied for the past few years. In this talk the author concentrates on the prospects for obtaining information through inclusive production of η mesons on nuclei, and reviews the question of whether η mesons can be used to extract information on the $s\bar{s}$ content of the nucleon.

13746 (BNL–52389, pp. 517-522) **Multi-nucleon effects in nuclear production of etas.** Liu, L.C. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Eta-nucleon interaction and the dynamics of nuclear eta production are discussed. It is shown why distorted-wave impulse approximation must not be used in the analysis of these reactions. It is also shown that in the threshold region, nuclear production of etas exhibits high spin-isospin selectivity and can be used to study nucleon-nucleon correlations.

13747 (BNL–52389, pp. 529-534) **Plans for η-meson production studies at COSY Juelich.** Seyfarth, H. (Institut fuer Kernphysik Forschungszentrum Juelich (Germany)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The basic data on the Juelich cooler synchrotron COSY are given. Four experiments at internal and external target positions are described which aim at studying the production mechanisms for π, η and heavier mesons and the meson-nucleon, meson-nucleus, and meson-meson final state reactions.

13748 (BNL–52389, pp. 541-550) **The reactions $pN \rightarrow pN\eta$ and $pA \rightarrow \eta X$ at SATURNE with the PINOT spectrometer.** Chiavassa, E. (dell'Universita, Torino (Italy)); Dellacasa, G.; De Marco, N.; Ferrero, F.; Gallio, M.; Guaita, P.; Musso, A.; Piccotti, A.; Scomparin, E.; Vercellin, E.; Durand, J.M.; Martins, C.P.D.O. Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at*

multi-GeV hadron beam facilities. 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

The inclusive η production in nuclei has been studied at SATURNE near the threshold of the elementary reaction $NN \rightarrow NN\eta$ (T_p = 1.26 GeV) by means of the PINOT spectrometer. The doubly differential cross-sections are presented and compared to recent theoretical calculations. Preliminary results for the reactions $pp \rightarrow pp\eta$ and $pd \rightarrow \eta X$ at T_p = 1.265, 1.3, 1.4 and 1.5 GeV are also discussed.

13749 (BNL–52389, pp. 551-556) **Past, present and future of (π, η) experiments.** Peng, J.C. (Los Alamos National Lab., NM (United States)). Brookhaven National Lab., Upton, NY (United States). [1993]. (CONF-930389–: Future directions in particle and nuclear physics at multi-GeV hadron beam facilities, Upton, NY (United States), 4-6 Mar 1993). In *Future directions in particle and nuclear physics at multi-GeV hadron beam facilities.* 618p. Order Number DE94002946. Source: OSTI; NTIS; INIS.

Following a discussion of some physics issues in η experiments, the current status of the (π, η) experiments is reviewed. Future prospects for η experiments are also presented.

13750 (BNL–60040) **Empirical observations on the unpredictable behavior of nuclear matter.** Tannenbaum, M.J. Brookhaven National Lab., Upton, NY (United States). 19 Jan 1994. 9p. (In English, French). Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE94007976. Source: OSTI; NTIS; INIS; GPO Dep.

While many aspects of matter are unpredictable from basic principles, there are some that are susceptible to empirical descriptions which can be quite accurate and beautiful. One such example from the field of "Nuclear Matter Under Extreme Conditions" is the distribution of the number of particles produced, or alternatively, of the energy carried by these particles, in energetic collisions of atomic nuclei. The present work consists of a series of published scientific papers on measurements of the distribution of particles produced, or the energy carried by these particles, in collisions of various nuclei, spanning more than a decade of research. Due to the unpredictability of the theory, the work includes empirical studies of the regularity of the measured distributions from which significant knowledge is gained. The aesthetics of this subject derives from the physical beauty of the measured curves, the characteristic changes of shape with different species of nuclei, and the deep understanding obtained by the use of a simple and elegant mathematical function to describe the data.

13751 (BONN-IR–93-63) **Measurement of the left-right asymmetry in the electrofission of the deuteron.** Frommberger, F. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. Nov 1993. 117p. (In German). Order Number DE94747249. Source: OSTI; NTIS (US Sales Only); INIS.

At the Electron Stretcher Accelerator ELSA of the Bonn University the left-right asymmetry $A_\phi$of the reaction d(e,e'p)n has been measured in quasi-free kinematics (E_e=1.6 GeV, θ_e=14). The scattered electrons were detected with a magnetic spectrometer. Due to the high duty cycle of ELSA non-magnetic proton detectors could be used. Therefore a simultaneous measurement at different proton angles was possible, leading to small systematic errors. The remaining systematic errors have been studied carefully and corrected. The experimental data are in good agreement with theoretical calculations, if relativistic corrections are taken into account. (orig.)

13752 (CEA-CONF–11434) **Measurement of the transverse, longitudinal and transverse-longitudinal structure functions for the reaction $^3He(e,e'p)^2H$.** Lakehal-Ayat, L. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee); Marchand, C.; Bernheim, M.; Danel, J.F.; Ducret, J.E.; Legoff,.CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee. 1991. 6p. (CONF-9105222–: 5. workshop on perspectives in nuclear physics at intermediate energies, Trieste (Italy), 6-10 May 1991). Order Number DE94618675. Source: OSTI; NTIS (US Sales Only); INIS.

The authors measured the cross section for the reaction $^3He(e,e'p)^2H$ and extracted the transverse (T), longitudinal (L) and transverse-longitudinal (TL) response functions. The momentum distributions obtained from these responses are compared to calculations which use the Argonne potential. The q-dependence of the Transverse and Longitudinal spectral functions are discussed and a conclusion is drawn. (author).

13753 (CEA-CONF–11447) **Strangeness production experiments at Saturne.** L'hote, D. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee. 1991. 6p. (CONF-911208–: International symposium on hypernuclear and strange particle physics - 20th international symposium of the Institute for Nuclear Study (INS) of the University of Tokyo, Shimoda (Japan), 9-12 Dec 1991; DAPNIA-SPN–92-02.). Order Number DE94618655. Source: OSTI; NTIS (US Sales Only); INIS.

The recent results, current experiments, and future projects at SATURNE, in what concerns the measurement of strangeness production in p+p and p+A reactions at energies below 2.9 GeV are presented. (author).

13754 (CEA-DPhN–91-56) **Fission isomers.** Paya, D. CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Physique Nucleaire. Sep 1991. 13p. (In French). (CONF-9109534–: International Joliot Curie conference on nuclear physics, Maubuisson (France), 16-21 Sep 1991). Order Number DE94618708. Source: OSTI; NTIS (US Sales Only); INIS.

After a short historical account of superdeformed nuclei which are able to de-excite by spontaneous fission (hence their name of fission isomers) the principles of different experimental set-ups are described. These set-ups were used to study various properties: half-life, excitation energy, spin, gyromagnetic factor, moment of inertia and quadrupole moment. The most significant values are given. Finally, the question of the various types of excited states of fission isomers is tackled. (author) 20 refs.; 17 figs.

13755 (CEA-DSM-T–93-19) **Anisotropy: a new signature of transverse collective flow.** Ollitrault, J.Y. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique). CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Direction des Sciences de la Matiere. 1993. 9p. (CONF-9301109–: 2. international conference on physics and astrophysics of quark-gluon plasma, Calcutta (India), 19-23 Jan 1993). Order Number DE94618684. Source: OSTI; NTIS (US Sales Only); INIS.

A method is proposed for identifying hydrodynamical flow of the matter produced in the central rapidity region of ultrarelativistic heavy ion collisions. Quantitative predictions are made on the basis of a hydrodynamical model. Statistical fluctuations are estimated and it is shown that collective behaviour, if any, should be seen unambiguously in Au or Pb collisions. (author) 13 refs.; 3 figs.

13756 (CRN–93-14) **Light charged particle emission in peripheral collisions in Kr+Au at 60 MeV/u in exclusive measurements.** Stuttge, L. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Aboufirassi, M.; Paulot, C. Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires. 1993. 9p. (CONF-9301126–: International winter meeting on nuclear physics, Bormio (Italy), 31 Jan 1993). Order Number DE94618685. Source: OSTI; NTIS (US Sales Only); INIS.

Energy spectra of Z=1 and 2 particles have been studied in a system bound to the projectile-like nucleus produced in the Kr+Au reaction at 60 MeV/u. This nucleus is slowed down to 75% of the beam velocity. The energy spectra of the particles show a different behaviour than that observed in a standard evaporation. (author) 7 refs.; 10 figs.

13757 (CRN–93-19) **Fragmentation pattern in sequential emission spectra.** Rudolf, G. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires); Tomasevic, S.; Aboufirassi, M.; Bizard, G.; Cassagnou, Y.; Legrain, R.; Ferrero, J.L.; Guilbault, F.; Lebrun, C. Strasbourg-1 Univ., 67 (France). Centre de Recherches

Nucleaires. 1993. 13p. Order Number DE94618686. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters, Sect. B (NL).

Coincident light particles and fragments produced in Kr+Au reactions, at 27, 44 and 60 MeV/u have been measured with a large solid-angle set-up. Energy spectra of Z=1,2 and 3 particles sequentially emitted by the slowed-down projectile-like nucleus evolve between an evaporation and a fragmentation pattern, suggesting a saturation in the thermalization process. (author) 13 refs.; 3 figs.

13758 (FEI–2252) **Evaluation of the ^{93}Nb (n,n')^{93m}Nb reaction cross section from the threshold up to 20 MeV.** Badikov, S.A.; Zolotarev, K.I.; Pashchenko, A.B. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 33p. (In Russian). Order Number DE94617008. Source: OSTI; NTIS (US Sales Only); INIS.

The data base comprising the results of the ^{93}Nb(n,n')^{93m}Nb reactions cross section measurements up to 1991 has been compiled. The experimental data have been renormalized to new values of standard cross-sections from the ENDF/B-6 and the IRDF-90 libraries. The evaluation of excitation function for the ^{93}Nb(n,n')^{93m}Nb reaction was carried out on the basis of procedure taking the correlation of experimental data into account. The files of evaluated cross-sections and covariance were prepared in the ENDF/B-6 format. The cross-section evaluations from present work and the IRDF-90 library are compared. 37 refs.; 3 figs.; 6 tabs.

13759 (FEI–2253) **Excitation functions of reactions of production of radioisotopes ^{201}Tl, ^{201}Pb, ^{201}Bi (experimental and theoretical data).** Kurenkov, N.V.; Lunev, V.P.; Masterov, V.S.; Shubin, Yu.N. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1992. 48p. (In Russian). Order Number DE94617009. Source: OSTI; NTIS (US Sales Only); INIS.

The results of calculations of charged particle induced reactions for the production of neutron deficient radioisotopes ^{201}Tl, ^{201}Pb, ^{201}Bi and concomitant ones are discussed. The excitation functions for reactions ^{202}Hg(p,xn), ^{197}Au(a,xn), ^{203,205}Tl(p,xn), ^{203,205}Tl(d,xn), ^{203,205}Tl(p,pxn), ^{204}Pb(p,xn), ^{204}Pb(p,p3n), ^{206}Pb(p,6n), ^{206}Pb(p,p5n), ^{207}Pb(p,7n), ^{207}Pb(p,p6n), ^{208}Pb(p,xn) and ^{208}Pb(p,p7n) are calculated on the base of statistical model in energy range up to 80 MeV. For the most reactions producing ^{201}Tl the data on the calculated and practical yields under optimum conditions are given and the main admixture levels are pointed out. 30 refs., 9 figs.

13760 (GANIL-P–93-12) **The analysis of the charged-fragment correlations using fragmentation-inactivation binary model.** Botet, R. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Solides); Ploszajczak, M. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 15p. Order Number DE94618687. Source: OSTI; NTIS (US Sales Only); INIS.

The fragmentation-inactivation binary model of the fragmentation at the transition line between the '∞-cluster' phase and the 'shattering' phase is applied for analyzing the nuclear multifragmentation data of ALADIN Collaboration for average charged-particle correlations in 600 MeV/u gold induced reactions on various targets. A constant break-up kernel, independent of the sizes of the daughter fragments, is used. By adjusting the strength of the inactivation probability function to the correlation between the mean size of the largest cluster and the composed particle first moment, it was found that the remaining charge correlation data is correctly reproduced by the fragmentation-inactivation binary model. (author) 18 refs.; 3 figs.

13761 (GANIL-P–93-14) **Fragmentation - inactivation binary model - a new model of kinetic sequential fragmentation.** Botet, R. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique des Solides); Ploszajczak, M. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 19p. (CONF-9304236–: Workshop on fragmentation phenomena, Houches (France), 12-17 Apr 1993). Order Number DE94618688. Source: OSTI; NTIS (US Sales Only); INIS.

Some general framework of sequential fragmentation is considered and the associated basic and universal features are studied briefly. First, the newly proposed Fragmentation - Inactivation - Binary model is defined which includes, as particular cases, most of the previous kinetic fragmentation models. The basic equations are given and it is shown how they give rise to the critical behaviour, called the shattering transition. This model is then compared qualitatively to recent data on gold multifragmentation at 600 MeV/nucl and a common universal behaviour is recovered. (author) 11 refs.; 3 figs.

13762 (GANIL-P–93-16) **On transient effects in violent nuclear collisions.** Suraud, E. (Paul Sabatier Univ., 31 - Toulouse (France). Lab. de Physique Quantique); Ayik, S.; Belkacem, M.; Feng-Shou Zhang. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). 1993. 22p. Grant DE-FG05-89 ER40530. Order Number DE94618689. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the numerical simulations of the recently developed Boltzmann-Langevin model exhibit large dynamical fluctuations in momentum space during the early stages of heavy-ion collisions, which arise from an interplay between the nuclear mean-field and binary collisions. It is pointed out that this transient behaviour provides an initial seed for the development of density fluctuations, and could strongly influence the particle production cross-sections at subthreshold energies. (author) 13 refs.; 3 figs.

13763 (GSI–93-22(prepr.)) **Particle production in high energy heavy-ion collisions.** Soff, G. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Vidovic, M.; Schneider, S.; Hilberg, D.; Hofmann, C.; Greiner, M. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 10p. Order Number DE94752372. Source: OSTI; NTIS (US Sales Only); INIS.

The formation of top quarks and Z^0 bosons in ultrarelativistic heavy-ion collisions is investigated. We considered U-U and Pb-Pb collisions at energies of 3.5 TeV/u and 8 TeV/u. Several different elementary production mechanisms incorporating quarks, gluons, and photons are considered and implemented into the employed parton model. Relevant quantities of toponium are calculated within a nonrelativistic potential model. We also evaluated the formation cross section for free t anti t pairs. The nuclei are treated as clusters of noninteracting nucleons. (orig.)

13764 (GSI–93-24(prepr.)) **Exotic particle production via strong transverse electromagnetic fields.** Greiner, M. (Arizona Univ., Tucson (United States). Dept. of Physics); Vidovic, M.; Soff, G.; Best, C. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 10p. Order Number DE94752373. Source: OSTI; NTIS (US Sales Only); INIS.

The equivalent photon method represents a conveniant tool to estimate cross sections for the electromagnetic particle production in ultrarelativistic heavy-ion collisions. We derive this method directly from QED and generalize it to include an impact parameter dependence. The electromagnetic production of Higgs bosons, supersymmetric particles and glueballs is discussed. (orig.)

13765 (GSI–93-25(prepr.)) **Investigation of reabsorption effects in subthreshold π^0 production.** Holzmann, R. TAPS Collaboration. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 18p. (CONF-9303261–: 2. European biennial workshop on nuclear physics, Megeve (France), 29 Mar - 2 apr 1993). Order Number DE94752371. Source: OSTI; NTIS (US Sales Only); INIS.

We present results from our experimental studies of reabsorption effects in sub-threshold π^0 production in the reactions ^{129}Xe+^{197}Au at 44 MeV/u, as well as ^{36}Ar+^{197}Au and ^{36}Ar+^{12}C at 95 MeV/u. From our data we extract information on the π^0 absorption length in nuclear matter. For the π^0 kinetic-energy range $\simeq$ 5 - 100 MeV the energy-averaged λ_{ABS} and its momentum dependence is obtained, and compared with optical-model calculations. We also show preliminary results from exclusive π^0 emission in coincidence with projectile-like fragments, giving evidence for pion production in very peripheral collisions. (orig.)

13766 (GSI–93-29(prepr.)) **QMD simulation of multifragment production in heavy ion collisions at E/A=600 MeV.** Begemann-Blaich, M. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Mueller, W.F.J.; Aichelin, J.; Adloff, J.C.;

Bouissou, P. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Apr 1993. 39p. Order Number DE94752359. Source: OSTI; NTIS (US Sales Only); INIS.

With the ALADIN forward spectrometer the fragmentation of gold nuclei at 600 MeV per nucleon after interaction with carbon, aluminum, copper and lead targets has been investigated. The results are compared to quantum-molecular-dynamics calculations using soft and hard equations of state as well as soft equation of state with momentum dependent forces. Whereas the QMD has been successfully applied to heavy ion collisions at lower energies, it is not possible to reproduce the fragment distributions and the light particle multiplicities observed in this experiment at relativistic energies. To study the reasons for the discrepancy between the experimental data and the simulations, we investigated the time evolution of the nuclear system after a collision and the disintegration pattern of excited nuclei in the QMD approach. (orig.). 9 figs.

13767 (GSI–93-33) **Antiproton production in heavy-ion collisions at energies below the threshold.** Schroeter, A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik. Aug 1993. 143p. (In German). Order Number DE94747605. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of this thesis the antiproton production in heavy ion collisions at projectile energies far below the threshold for anti p production in nucleon-nucleon collisions (5.63 GeV/u) was studied. A suited detection apparature was developed and constructed at the fragment separator-magnet spectrometer at the Society for Heavy Ion Research (GSI). For the identification of the antiprotons the momentum of the particles emitted in beam direction was measured and their velocity multiple-redundantly determined by means of time-of-flight measurements and threshold Cherenkov detectors. By this way the antiprotons could be in spite of low anti p production cross sections and high production rates for lighter particles ($R_{antip}:R_K^- - :R_\pi^- - \approx 1:5*10^3:10^7$) background-freely determined. By this experiment for Ne+NaF, Cu, Sn, and Bi as well ass Ni+Ni collisions at incident energies between 1.6 GeV/u and 2.0 GeV/u production cross sections for antiprotons in the momentum range between 1.0 GeV/c and 2.2 GeV/c and for kaons and pions between 0.5 GeV/c and 2.8 GeV/c were measured, in order to study the influence of collisional-system size, incident energy, and secondary-particle momentum on the production probabilities and to contribute in comparison with the prognoses of theoretical models to the explanation of the particle production mechanisms. (HSI)

13768 (GSI–93-52(prepr.)) **Particle production in heavy-ion collisions at intermediate energies.** Toneev, V.D.; Gudima, K.K. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jul 1993. 35p. Order Number DE94752449. Source: OSTI; NTIS (US Sales Only); INIS.

The kinetic model developed previously for ultra-relativistic hadron-nucleus and nucleus-nucleus collisions has been extended to describe particle production processes in the intermediate energy range. A version of the quark-gluon string model is used to get an input information on unstable particles produced in hadron-hadron collisions. The available experimental data on particle production from heavy-ion collisions in the GeV energy region including recent results from the SIS accelerator (Darmstadt) are analyzed in terms of this model. Alongside with nucleons and pions, the production of η-mesons, strange K^+- and K^--mesons, ω and ρ^0 resonances, antiprotons and e^+e^- pairs is discussed on the same footing. The key role of resonances in multistep processes of subthreshold hadron production is stressed. Model predictions for current and planned experiments at the SIS accelerator are given. (orig.)

13769 (GSI–93-71(prepr.)) **Relativistic Coulomb excitation by a deformed projectile.** Bertulani, C.A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1993. 12p. Order Number DE94747486. Source: OSTI; NTIS (US Sales Only); INIS.

The effects of a deformed projectile charge on the relativistic Coulomb excitation theory are investigated. The effects of relevance are (a) the variation of the minimum impact parameter as a function of the orientation of the projectile and (b) the modification of the time dependent electromagnetic field due to the projectile deformation. (orig.)

13770 (GSI–93-74(prepr.)) **Fragmentation of a 500 MeV/nucleon ^{86}Kr beam, investigated at the GSI projectile fragment separator.** Weber, M. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Donzaud, C.; Dufour, J.P.; Geissel, H.; Grewe, A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Oct 1993. 14p. (CONF-9310298–: International workshop on radioactive nuclear beams produced by fragment-separation techniques, Varna (Bulgaria), 12-15 Oct 1993). Order Number DE94751878. Source: OSTI; NTIS (US Sales Only); INIS.

Production cross-sections and longitudinal momentum distributions have been investigated for reactions between a 500 MeV/nucleon ^{86}Kr beam and beryllium, copper and tantalum targets. Fragments in a wide A/Z range were studied at the projectile-fragment separator FRS at GSI. The experimental production cross-sections have been used for testing the predictions obtained from a semi-empirical parameterization, a statistical abrasion model and an intranuclear-cascade model. The present study allows to extrapolate the production cross-sections towards very neutron-rich isotopes such as the doubly magic nucleus ^{78}Ni. For fragments close to the projectile the measured longitudinal momentum distributions agrees qualitatively with a semi-empirical parameterization, which is based on the two-step picture of the fragmentation process. The momentum widths of lighter fragments, however, show deviations from this simple picture. (orig.)

13771 (INIS-BR–3251) **Thermalization in high energy proton-nucleus collisions.** Wedemann, R.S. Universidade Federal, Rio de Janeiro, RJ (Brazil). Inst. de Fisica. Mar 1988. 58p. (In Portuguese). Order Number DE94618656. Source: OSTI; NTIS (US Sales Only); INIS.

A relativistic proton-nucleus collision using the intranuclear cascade model is studied. The purpose is to verify the equilibration hypothesis at fragmentation time made by many nuclear fragmentation models. (author).

13772 (INIS-mf–13780, pp. 46) **Nucleon's internal spin.** Arash, F. (Amirkabir Univ. of Technology, Tehran (Iran, Islamic Republic of) Dept. of Physics). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRONS/structure functions; SPIN; DEEP INELASTIC SCATTERING; GLUONS; NEUTRONS; NUCLEONS; PROTONS; QUARKS; SPIN

13773 (INIS-mf–13780, pp. 49) **The techniques used to discover ^{102} Sn.** Rastikardar, S. (Isfahan Univ., (Iran, Islamic Republic of) Dept. of Physics). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TIN 102/spectra; CHROMIUM 50 TARGET; IRON 56 REACTIONS; NICKEL 58 REACTIONS; SPECTRA

13774 (INIS-RU–367, pp. 142-153) **Low energy ternary fission.** Theobald, J.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1990. 664p. (In Russian, English). (CONF-8910237–: International school seminar on heavy ion physics, Dubna (USSR), 3-12 Oct 1989). In *International School-Seminar on Heavy Ion Physics.* Order Number DE94612504. Source: OSTI; NTIS (US Sales Only); INIS.

Experimental results of collaboration between Bordeaux-Darmstadt and the Leningrad Institute for Nuclear Physics are presented.

13775 (INP–1599/PL) **Chaotic scattering and heavy-ion fusion.** Okolowicz, J.; Srokowski, T. Institute of Nuclear Physics, Cracow (Poland). 1992. 22p. Order Number DE94617031. Source: OSTI; NTIS (US Sales Only); INIS.

Irregular scattering of few-body systems is discussed and applied to nuclear collisions: $\alpha + {}^{12}C$ and ${}^{12}C + {}^{12}C$. Nuclei are

constructed from interacting α-clusters, internal structure of α-partcles is neglected. Both systems reveal a transient behaviour - compound nuclei decay exponentially in time. The transmission coefficients and cross sections for fusion are calculated. The results are compared with experimental data. In addition, a stochastic force is introduced to simulate the nucleonic degrees of freedom. It is argued that chaotic dynamics is responsible for the formation and decay of compound nucleus. 11 figs., 28 refs. (author).

13776 (IPNO-DRE–93-01) **Single-particle and collective states in transfer reactions.** Lhenry, I. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Suomijaervi, T.; Giai, N. van; Chomaz, Ph. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 22 Jan 1993. 24p. Order Number DE94618690. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility to excite collective states in transfer reactions induced by heavy ions is studied. Collective states are described within the Random Phase Approximation (RPA) and the collectivity is defined according to the number of configurations contributing to a given state. The particle transfer is described within the Distorted Wave Born Approximation (DWBA). Calculations are performed for two different stripping reactions: $^{207}Pb(^{20}Ne,^{19}Ne)^{208}Pb$ and $^{59}Co(^{20}Ne,^{19}F)^{60}Ni$ at 48 MeV/nucleon for which experimental data are available. The calculation shows that a sizeable fraction of collective strength can be excited in these reactions. The comparison with experiment shows that this parameter-free calculation qualitatively explains the data. (author) 19 refs.; 10 figs.

13777 (IPNO-DRE–93-02) **Spin determination of valence and inner hole states via the ^{208}Pb(d-vector,t)^{207}Pb reaction at E_d=200 MeV.** Langevin-Joliot, H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Van de Wiele, J.; Guillot, J.; Rosier, L.H.; Duhamel-Chretien, G.; Gerlic, E.; Tomasi-Gustafsson, E.; Blasi, N. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 35p. Order Number DE94618676. Source: OSTI; NTIS (US Sales Only); INIS.

Highly excited neutron hole states in ^{207}Pb were studied via the (d-vector,t) reaction at 200 MeV, using for the first time a polarized beam with both vector and tensor components. The determination of overlapping neutron hole response functions takes advantage of the strong characteristic features of $j_-=l-1/2$ versus $j_+=l+1/2$ level analysing powers and of the good DWBA description of the reaction. The results are compared in details with those, previously obtained on the $1i_{13/2}$ and $1h_{9/2}$ valence state fragmentation up to E_x=6.7 MeV and on the $1h_{11/2}$ strength up to $\approx$10 MeV. The present experiment settles the attributions of several j_- versus j_+ valence groups and indicates that the $1h_{9/2}$ strength is spread up to $\approx$10.8 MeV. The spin orbit splitting of 1h orbitals in ^{208}Pb deduced from the strength centroids is 5.2 MeV. (R.P.) 32 refs.; 9 figs.; 6 tabs.

13778 (IPNO-DRE–93-06) **Proton emission from heavy ion inelastic scattering: a signature of multiphonon states.** Scarpaci, J.A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Blumenfeld, Y.; Frascaria, N.; Garron, J.P.; Lamehi-Rachti, M.; Chomaz, Ph.; Massollo, P.; Alamanos, N. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 10p. (CONF-930197–: 9. winter workshop on nuclear dynamics, Key West, FL (United States), 30 Jan - 6 feb 1993). Order Number DE94618691. Source: OSTI; NTIS (US Sales Only); INIS.

Inelastic scattering of 50 MeV/N ^{40}Ca on ^{40}Ca was measured in coincidence with protons in order to investigate the excitation and decay of highly excited states. Proton pick-up break-up was measured and found to make up about 20% of the cross section at high excitation energies. Direct decay of the giant quadrupole resonance is extracted and the two-phonon state around 34 MeV excitation energy, accompanying the giant quadrupole resonance, is assigned through its specific direct decay pattern. (author) 13 refs.; 5 figs.

13779 (IPNO-DRE–93-12) **Dynamics of violent collisions induced by Ar on Ag between 27 and 60 MeV/nucleon: Persistence of binary dissipative collisions and temperature limits.** Rivet, M.F. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Borderie, B.; Box, P.; Dakowski, M; Cabot, C.; Gardes, D.; El Masri, Y.; Hanappe, F.; Sebille, F.; Haddad, F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 17p. (CONF-9301126–: International winter meeting on nuclear physics, Bormio (Italy), 31 Jan 1993). Order Number DE94618692. Source: OSTI; NTIS (US Sales Only); INIS.

The dynamics of violent collisions were studied for the ^{40}Ar + ^{nat}Ag system between 27 and 57 MeV/u. The persistence of binary dissipative collisions over this energy range was demonstrated. They are accompanied by preequilibrium emission, the abundance of which increases with the violence of the collision, and with the incident energy. The evolution of the damping of the relative motion with the emission angle of the light partner is compared with the predictions of dynamical calculations, which brings information on the nucleon-nucleon cross section in the nuclear medium. Finally a limitation of the thermal excitation energy is observed, through the saturation of both the temperature (7 MeV) of the heavy partner and the multiplicity of light charged particles that it emits. (author) 13 refs.; 7 figs.; 2 tabs.

13780 (IPNO-DRE–93-13) **$^{27}Al(d,^3He)^{26}Mg$ reaction at 29 MeV.** Vernotte, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Berrier-Ronsin, G.; Fortier, S.; Hourani, E.; Kalifa, J.; Maison, J.M.; Rosier, L.H.; Rotbard, G.; Wildenthal, B.H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 48p. Order Number DE94618693. Source: OSTI; NTIS (US Sales Only); INIS.

The $^{27}Al(d,^3He)^{26}Mg$ reaction was investigated at 29 MeV incident energy. Observations using a split-pole magnetic spectrograph were made of 65 levels of ^{26}Mg in the range of excitation energy between 0 and 9.7 MeV. These levels can be identified with the known states of ^{26}Mg. Information about the orbital angular momentum (with associated conclusions about J and π) and the single-nucleon spectroscopic factors of about 40 of these ^{26}Mg levels was obtained through distorted-wave Born approximation analyses of measured angular distributions. The excitation energies and spectroscopic factors for positive parity states are compared with the results of a recent, complete sd-shell space, shell-model calculation. New spectroscopic information is extracted from this comparison and from the comparison of the present results with previous knowledge. (K.A.) 23 refs.; 10 figs.; 6 tabs.

13781 (IPNO-TH–92-105) **Sub- and near-barrier fusion potentials and cross sections.** Vinh Mau, N. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Pacheco, J.C.; Ferrero, J.L.; Bilwes, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Dec 1992. 26p. Order Number DE94618694. Source: OSTI; NTIS (US Sales Only); INIS.

In a closure approximation model which was used to calculate the absorptive potential of elastic scattering, the contribution due to absorption in direct non elastic channels can be extracted. Following the one channel models of fusion the potential W_F describing absorption in fusion channels was calculated. The model was applied to the system ^{16}O + ^{208}Pb. The potential W_F has, in sub- and near-barrier domains, a very short range, in agreement with empirical analyses of fusion, but this short range varies with energy. The calculated fusion cross sections reproduce quite well the data, in particular in the far sub-barrier region where the energy dependence of the range is crucial to reproduce the experimental values. (author) 31 refs.; 11 figs.

13782 (ITF–92-49R) **On the electroexcitation of the nuclei in giant resonance region with radiative corrections taken into account.** Tartakovskij, V.K.; Fursaev, A.V.; Las'o, A.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 9p. (In Russian). Order Number DE94617004. Source: OSTI; NTIS (US Sales Only); INIS.

The form factors of the electroexcitation of the nucleus ^{16} O states with energies 22.6 and 25.7 MeV in the giant resonance region with radiative corrections are calculated in terms of many-particle shell model. The consideration of the radiative corrections and correction for second Born approximation improves agreement with experiment. (author). 13 refs., 5 figs.

13783 (ITF–93-12R) **Matrix elements of the potential energy operator for the six nucleon system between the generating invariants.** Filippov, G.F.; Lopez Trujillo, A.; Rybkin, I.Yu. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki.

1993. 12p. (In Russian). Order Number DE94618677. Source: OSTI; NTIS (US Sales Only); INIS.

The matrix elements of the potential energy operator (which includes central, spin-orbit and tensor components) are calculated between the generating invariants of the cluster basis describing α + d and t+h configurations of the six-nucleon system. (author). 12 refs.

13784 (ITF–93-25R) **The polarization of deuterons in the process of their collision.** Maksimenko, V.N.; Romanov, V.N.; Filippov, G.F. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 25p. (In Russian). Order Number DE94618678. Source: OSTI; NTIS (US Sales Only); INIS.

The process of polarization and disintegration of deuterons in their collision is studied within framework of the RGM algebraic version. Generating functions are introduced to produce the basis of the states, the most actual for the problem concerned. Generating matrix elements are calculated for the unity operator and the Hamiltonian. Expressions are obtained to calculate the matrix elements between the basis states. (author).9 refs.

13785 (IYaF–92-66) **SCATTER program of cross section calculation of the hadron and lepton interactions with nuclei.** Makhov, A.M. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 32p. (In Russian). Order Number DE94617006. Source: OSTI; NTIS (US Sales Only); INIS.

The description is given of the SCATTER program intended for carrying out numerical calculations of the differential cross sections of elastic scattering, the total cross sections and cross sections of the K, π, N, d, α, e, μ interactions with nuclei in the incident particle energy range from 0 to 1 GeV. The algorithm brief description, user instruction and comparison results of calculations and experiments are given. 12 refs.; 8 figs.; 1 tab.

13786 (JINR–2-93-59) **JINR rapid communications: Collection.** Zarubina, M.I.; Ivashkevich, Eh.V.; Kalinnikova, E.V. (eds.). Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 115p. (In English, Russian). Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The collection JINR Rapid Communications includes the articles providing information on the investigation results at the accelerating facility of Laboratory of high energies (LHE) in Dubna. The problems are discussed: inclusive production of neutral strange particles in antideuteron-nuclei interactions at 12.2 GeV/c, measurement of the Pontecorvo p-bar + d → π^+ + p, reaction for the antiproton annihilation at rest, fine structure in cold fission mass distribution of $^{249}Cf(n_{th},f)$ reaction, the first run with ^{32}S relativistic nuclei at the 2 HE accelerating facility in Dubna, the first results of the muonium to antimuonium conversion experiment at Dubna phasotron.

13787 (JINR–2-93-59, pp. 22-46) **Inclusive production of neutral strange particles in antideuteron-nuclei interactions at 12.2 GeV/c.** Batyunya, B.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Boguslavskij, I.V.; Bruncho, D.; Koka, K.; Gramenitskij, I.M.; Medved, K.S.; Ponta, T.; Simkovikova, I.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The data on inclusive production of Λ and K^0_s in antideuteron-deuteron, antideuteron-carbon and antideuteron-lead interactions at 12.2 GeV/c are reported. The results are given on relative yields, rapidity distribution, average multiplicities of associated charged particles, and kinematical characteristics of neutral strange particles. The possible difference of production mechanisms for K^0_s- and Λ-particles, as well as the enhancement of Λ-hyperons yield in events with the developed cascade, are also discusses. The data were obtained while irradiating the 2 m bubble chamber LUDMILA with a separated antideuteron beam at the Serpukhov accelerator. 25 refs., 10 figs., 6 tabs.

13788 (JINR–2-93-59, pp. 75-97) **Measurement of the Pontecorvo reaction p-bar + d → π^- + p for the antiproton annihilation at rest.** Ableev, V.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Maneva, G.; Nikitiu, F. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the new measurements of the reaction p-bar + d → π^- + p the antiproton annihilation at rest are presented. A total of 77 events of this reaction have been found in different trigger configurations. The branching ratio of the reaction is W(p-bar + d → π^- + p)=(1.20 ±0.14)x10^{-5}. The first indication fo the observation of another Pontecorvo reaction p-bar + d → π^- + p was obtained. 17 refs.; 11 figs.; 2 tabs.

13789 (JINR–2-93-59, pp. 98-104) **Fine structure in cold fission mass distribution of $^{249}Cf(n_{th},f)$ reaction.** Pyatkov, Yu.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Shekhmamet'ev, R.A.; Slyusarenko, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The first results on cold fission for $^{249}Cf(n_{th},f)$ reaction are presented. The fine structure in cold fission mass distributions for $^{249}Cf(n_{th},f)$ drastically differs from the cold fission data for $^{252}Cf(s,f)$ reaction. This fact is explaned within the framework of the suggested cluster concept of the multivalley fission model. 12 refs.; 3 figs.

13790 (JINR–3-93-60, pp. 32-39) **Fission barrier heights for ultra neutron-deficient nuclides ^{188}Pb and ^{196}Po.** Andreev, A.N.; Bogdanov, D.D.; Veselski, M.; Eremin, A.V.; Ter-Akop'yan, G.M.; Sharo, Sh. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (In Russian). In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The reduced probabilities of delayed fission channels $P_{\beta df}$ for ^{188}Bi and ^{196}At are determined, from experimental data, to be 3.4 x 10^{-5} and 8.8 x 10^{-4}, respectively. The comparison of the obtained and calculated values of $P_{\beta df}$ allowed to estimate the fission barriers for ^{188}Pb and ^{196}Po. The investigation has been performed at the Laboratory of Nuclear Reactions, JINR. 18 refs., 2 figs., 3 tabs.

13791 (JINR–6-92-57, pp. 9-17) **Retardation effects in ed → e'np reaction.** Burov, V.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Goj, A.A.; Sus'kov, S.Eh. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

Electrodisintegration of the deuteron near pion threshold with allowance for retardation effects in meson-exchange currents is studied. It is shown that retardation effects should be taken into account at large transfer momenta ($t > 10$ fm^{-2}). The radial dependence of the matrix elements for d → ^{1}So-transition has been investigated. It is found that the inclustion of meson exchange currents with allowance for retardation effects is important at r = 1-1.5 fm, when $t > 30$ fm^{-2}. 12 refs.; 5 figs.

13792 (JINR–6-92-57, pp. 63-79) **Elastic scattering of a secondary ^{11}Li beam on ^{28}Si at 29 MeV/n.** Gareev, F.A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions); Ershov, S.N.; Kazacha, G.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1992. In *JINR rapid communications: Collection.* 92p. Order Number DE94618202. Source: OSTI; NTIS (US Sales Only); INIS.

The elastic scattering of a secondary ^{11}Li beam (29 MeV/n) on a ^{28}Si target has been measured for the first time. An attempt has been made to reproduce the data in a phenomenological analysis and with coupled channel calculations with a double folding optical potentials, with energy and density dependent effective interaction and realistic densities. In coupled channel calculations with the folding optical potential a better description is achieved if a neutron halo ^{11}Li is taken into account. 33 refs.; 8 figs.; 4 tabs.

13793 (JINR-E–1-92-372) **Measurement and processing of gammas accompanying muon pairs in the reaction $\pi^-C \rightarrow \mu^+\mu^-+\gamma+X$ at 38 GeV.** Bannikov, A.V.; Chelkov, G.A.; Krumshtejn, Z.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation).

Lab. of Nuclear Problems. 1992. 11p. Order Number DE94617044. Source: OSTI; NTIS (US Sales Only); INIS.

A set of carbon targets and lead glass converters were placed in the sensitive volume of a streamer chamber of the magnetic spectrometer RISK in the experiment SERP-151 on the study of exclusive processes of production of muon pairs and J/Ψ-particles in πC interactions at 38 GeV. 5 refs.; 6 figs.

13794 (JINR-E–3-93-205) **Systematics of the (n,p) reaction cross sections averaged over ^{235}U thermal fission neutron spectrum.** Khuukhenkhuu, G.; Gledenov, Yu.M.; Sedysheva, M.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 4p. (In Russian). Order Number DE94618657. Source: OSTI; NTIS (US Sales Only); INIS.

An empirical formula has been suggested to describe the dependence of known exponential (n,p) reaction cross sections averaged over ^{235}U thermal fission neutron spectrum on the asymmetry parameter (N-Z)/A of the target nucleus. 9 refs.; 1 fig.; 1 tab.

13795 (JINR-E–4-93-262) **Competition between complete fusion and quasi-fission in reactions between massive nuclei. The fusion barrier.** Antonenko, N.V. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Cherepanov, E.A.; Permyakov, V.P.; Volkov, V.V.; Nasirov, A.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 10p. Order Number DE94618695. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Phys. Lett., Sect. B.

The analysis of the evaporation residue cross sections in reactions ^{100}Mo+^{100}Mo and ^{110}Pd+^{110}Pd has been carried out within different models of fusion. A model for calculation of the competition between the complete fusion and quasi-fission in massive symmetric dinuclear systems is proposed. In the framework of this model the calculation results are in satisfactory agreement with the experimental data. 14 refs.; 4 figs.

13796 (JINR-E–7-93-278) **Multifragmentation in ^{4}He+Au collisions at relativistic energies, studied with the 4π-setup FASA.** Avdeev, S.P. (and others); Karnaukhov, V.A.; Kuznetsov, V.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 13p. Order Number DE94618679. Source: OSTI; NTIS (US Sales Only); INIS.

Multifragmentation of a target spectator has been studied in ^{4}He+Au collisions at energies of 1.0 and 3.65 GeV/nucleon with the new 4π setup FASA. The angular correlation for coincident fragments shows a significant depletion of the yield for the small relative angles, caused by the Coulomb interaction between fragments. 18 refs.; 8 figs.; 1 tab.

13797 (JINR-R–15-93-218) **(Gamma,2n) reaction on the high-spin nucleus ^{180m}Ta.** Karamyan, S.A.; Belov, A.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. 8p. (In Russian). Order Number DE94618650. Source: OSTI; NTIS (US Sales Only); INIS.

Gamma-ray spectra of the targets activated by the bremsstrahlung with a maximum energy of 15.5-23.5 MeV were measured. The energy dependence of the yield was determined for the seven radioactive products. 7 refs.; 4 figs.; 1 tab.

13798 (KFK–5127) **Dissipative aspects of intermediate-mass fragment emission in nuclear collisions.** Brancus, I.M. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Kernphysik. Feb 1993. 24p. (CONF-9208218–: Predeal International Summer School in Physics on topics in atomic and nuclear collisions, Predeal (Romania), 31 Aug - 11 sep 1992). Order Number DE94752378. Source: OSTI; NTIS (US Sales Only); INIS.

A sum-rule model (ESM) accounting for dissipative processes in heavy ion collisions is discussed and applied to the analyses of intermediate-mass fragment emission observed in light and heavy ion induced reactions. It reproduces the observed Z distributions of the complex fragments at low and intermediate energies and reveals the angular momentum localization of various contributing mechanisms. (orig.)

13799 (KFK–5170) **Experimental determination of the stellar neutron capture cross sections of ^{148}Sm and ^{150}Sm and the consequences for the s-process.** Guber, K.H. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Kernphysik; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Physik. Mar 1993. 71p. (In German). Order Number DE94745996. Source: OSTI; NTIS (US Sales Only); INIS.

The Karlsruhe 4π-BaF_2-detector was upgraded by implementation of an ADC system, consisting of two ADC's for each of the 42 detector modules for determination of the gamma-ray energy and time of flight. A preprocessing option allows for an examination of the registered events in order to reject backgrounds before storing. With the ADC system it is now possible to improve the energy resolution of the 4π array by correcting for the nonlinearities of the single detector modules. Multiplicities and angular distributions of the registered capture cascades can be extracted and capture gamma-ray spectra can be determined in dependence of the cascade multiplicity. The neutron capture cross sections of ^{147}Sm, ^{148}Sm, ^{149}Sm, ^{150}Sm and ^{152}Sm were measured in the energy range from 3 to 225 keV with an uncertainty of 1%. The cross sections were averaged over a Maxwell-Boltzmann distribution in the range of kT = 10-100 KeV. The resulting stellar neutron capture cross sections are important for a detailed analysis of the s-process in the Nd-Pm-Sm region. The ratio $R=\sigma N_s(148)/\sigma N_s(150)$ of the two s-only isotopes ^{148}Sm and ^{150}Sm was determined to 0.882 ± 0.009. This is significantly lower than unity, the local approximation of the classical s-process (σN=const) does not apply for the samarium isotopes. The corresponding branchings of the s-process path in the region A=147-149 were analysed with the classical model, resulting in a mean neutron density of $n_n = (3.8\pm0.6).10^8 cm^{-3}$. With the improved cross sections of the samarium isotopes it was possible to reduce the uncertainty of this value by a factor two compared to previous studies. It the new data are used with stellar model for the s-process during helium shell burning in low mass stars, the observed abundance ratio $N_s(148)/N_s(150)$ could not be reproduced within the experimental uncertainties. (orig.)

13800 (LA-UR–94-0384) **R-matrix analysis for nitrogen and oxygen.** Hale, G.M. (Los Alamos National Lab., NM (United States)); Young, P.G.; Chadwick, M.B.; Chen, Z.-P. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by US-DOE, Washington, DC (United States);Defense Nuclear Agency, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940424–11: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94006157. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hiroshima-Nagasaki Dose Reevaluation Program, new evaluations of the neutron cross sections for ^{14}N and ^{16}O were made for ENDF/B-VI, based at low energies on multichannel R-matrix analyses of reactions in the ^{15}N and ^{17}O systems. The types of data used in the analysis, and the resulting cross sections and resonance structures are briefly described. The resonance structure in the neutron cross sections was especially well determined by including precise, high-resolution neutron total cross section measurements from Oak Ridge and Karlsruhe. The new evaluated cross sections, wile thought to be significantly better than the earlier ones, improve, but do not completely remove, the dose discrepancies that persist, especially in the Hiroshima explosion.

13801 (LA-UR–94-441) **Proton production cross sections of ^{14}C from silicon and oxygen: Implications for cosmic-ray studies.** Sisterson, J.M. (Harvard Univ., Cambridge, MA (United States). Cyclotron Lab.); Jull, A.J.T.; Beverding, A. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by US-DOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Grant NAGW 6124; Grant EAR 92-03383. (CONF-930960–10: 6. international conference on accelerator mass spectrometry, Canberra (Australia), 17 Sep - 1 oct 1993). Order Number DE94006146. Source: OSTI; NTIS; GPO Dep.

The production rates of ^{14}C from proton spallation of silicon, and oxygen have been measured over a wide range of energies from 31 to 450 MeV. ^{14}C was measured by accelerator mass spectrometry (AMS) after extraction of carbon from the samples by melting in a flow of oxygen.

13802 (LA-UR–94-713) **Antiproton production in heavy ion collisions.** Jacak, B.V. NA44 Collaboration. Los Alamos National Lab., NM (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310293–1: NATO Advanced Study Institute on hot and dense nuclear matter, Bodrum (Turkey), 5 Oct 1993). Order Number DE94007552. Source: OSTI; NTIS; INIS; GPO Dep.

In high energy p-p and $\alpha - \alpha$ collisions, baryons are observed predominantly at rapidities near those of target and projectile; the mean rapidity shift of projectile and target nucleons is approximately one unit. In the central rapidity region, the number of baryons is quite small. In fact, the number of baryons and antibaryons is rather similar, indicating that most of these baryons are CREATED particles rather than projectile and target fragments. Antibaryon production is of interest in heavy ion collisions as enhanced antiquark production has been predicted as a potential signature of quark-gluon plasma formation. Antibaryons also provide a sensitive probe of the hadronic environment, via annihilation and/or mean field effects upon their final distributions. However, the collision dynamics also affect the baryon and antibaryon distributions. Baryons are more shifted toward midrapidity in nucleus-nucleus and p-p nucleus collisions than in p-p collisions, increasing the probability of annihilating the antibaryons. The interpretation of antibaryon yields is further complicated by collective processes which may take place in the dense hadronic medium formed in nucleus-nucleus collisions. Jahns and coworkers have shown that multistep processes can increase antibaryon production near threshold. Antiproton production is clearly very interesting, but is sensitive to a combination of processes taking place in the collision. The final number of observed antiprotons depends on the balance between mechanisms for extra antiproton production beyond those from the individual nucleon-nucleon collisions and annihilation with surrounding bayrons. We can hope to sort out these things by systematic studies, varying the system size and beam energy. I will review what is known about antiproton production at both the AGS and SPS, and look at trends going from p-p to p-nucleus to nucleus-nucleus collisions.

13803 (LYCEN–9335) **Light particle emission in the reaction $^{144}Sm(^{32}S,fission)$ at E_{lab}=838 MeV.** Benrachi, F. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Benchekroun, D.; Chambon, B.; Cheynis, B.; Rossner, H.; Hilscher, D.; Gebauer, B.; Giorni, A.; Heuer, D.; Lleres, A. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Jun 1993. 42p. Order Number DE94618709. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Review, C (Nuclear Physics) (US).

Energy spectra of light charged particles have been measured in coincidence with fission-like fragments using the 4π charged-particle detector AMPHORA. Pre-equilibrium, pre-scission and post-scission components of emitted protons, deuterons, and alphas have been extracted from the energy spectra using a multiple source fit procedure. The results have been confronted with statistical model computations. A fair overall agreement is observed for different parameterizations of the Fermi gas level density parameter with indications for a decrease of the level density with increasing nuclear temperature. The correlations between slope parameter, pre-scission and total particle multiplicity turned out to be a sensitive probe for the level density parameter. (K.A.) 28 refs.; 12 figs.; 3 tabs.

13804 (NIIYaF-MGU–91-16-220) **Perspectives of studying spin effects in elastic pp-scattering at UNK by means of 'NEPTUN' installation.** Zakharov, B.G.; Kruglov, N.A.; Proskuryakov, A.S.; Sarychev, L.I. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1991. 24p. (In Russian). Order Number DE94617010. Source: OSTI; NTIS (US Sales Only); INIS.

Prospects of studying spin effects in elastic pp-scattering at a UNK using the 'NEPTUN' installation are analyzed in the work. Different theoretical models describing polarization phenomena in the high energy physics are discussed. A possibility of measuring all the components of depolarization tensor is considered. 41 refs., 1 fig.

13805 (NIIYaF-MGU–91-20-224) **Spectra of light particles and gamma-quanta in the neutron reactions on ^{133}Cs and ^{127}In in the neutron energy range from 6 up to 30 MeV.** Moskalenko, I.V.; Parfenova, Yu.L.; Ryumin, S.P.; Fotina, O.V. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1991. 18p. (In Russian). Order Number DE94617011. Source: OSTI; NTIS (US Sales Only); INIS.

The paper deals with calculations of light particles -neutrons, protons alpha-particles and gamma-quanta emitted from Cs and I nuclei in reactions with incident neutrons.

13806 Improved process for preparing strontium-82 isotope. Michaels, G.E.; Beaver, J.E.; Moody, D.C. To Dept. of Energy. 1991. Filed date 20 Dec 1991. U.S. patent application 7-811,222. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94005160. Source: OSTI; NTIS; INIS; GPO Dep.

This invention is comprised of a process for making ^{82}Sr by bombarding a molybdenum target enriched in light-mass molybdenum isotopes with high energy protons resulting in high yield, high purity ^{82}Sr.

13807 (PCCF-RI–93-08, pp. 8-9) **Nuclear fragmentation of high-energy light-ion beams in water.** Schall, I. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Schardt, D.; Geissel, H.; Kraft, G.; Magel, A.; Mohar, M.F.; Muenzenberg, G.; Nickel, F.; Kankeleit, E.; Fukumura, A. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

Light-ion beams ranging between carbon and neon with energies of a few hundred MeV/u offer favorable conditions for the treatment of deep-seated tumors. Nuclear fragmentation experiments are presented to study favorable therapy beams simultaneously in thick water target. Comparative measurements with ^{10}B, ^{12}C, ^{14}N, ^{16}O beams are described. (R.P.) 5 refs.; 4 figs.

13808 (UCRL-JC–114757) **Role of the second barrier upon mass division in the spontaneous fission of the heaviest elements.** Hulet, E.K. Lawrence Livermore National Lab., CA (United States). Oct 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309253–2: 12. meeting on physics of nuclear fissions, Obninsk (Russian Federation), 27-30 Sep 1993). Order Number DE94007079. Source: OSTI; NTIS; INIS; GPO Dep.

In the region where theorists had earlier predicted the disappearance of the outer fission barrier or of it dropping below the ground-state, we have measured the mass and total-kinetic-energy distributions from spontaneous fission of ^{252}No, ^{254}No, $^{256}[104]$, and $^{258}[104]$. The results, in combination with earlier measurements for ^{256}No, ^{258}No, and ^{262}No, show a sharp transition from asymmetrical mass division in ^{256}No to symmetrical ones for ^{258}No and ^{262}No. On-the-other-hand, all isotopes of element 104 including $^{260}[104]$ appear to yield broadly symmetrical mass distributions. The total-kinetic energies around 200 MeV for the 104 isotopes indicate they fission by the low-energy mode of bimodal fission. Based on the hypothesis that the second barrier is responsible for asymmetrical mass distributions and when it disappears, for symmetrical ones, these observations for the isotopes of element 104 are in accord with 1976 calculations of the heights of the second fission barrier relative to the ground-state. Some recent calculations of static potential-energy surfaces and of barrier heights deduced from half-lives for spontaneous fission indicate the second barrier is from 0 to 2.9 MeV above the ground-state for the No and 104 isotopes. However, shape degrees-of-freedom have been limited in these calculations so that they fail to provide realistic heights for the outer fission barrier. For the few cases where higher-order asymmetrical deformations are included, this barrier height is well below the ground-state and, for these nuclides, we observe symmetric mass division only. Without more extensive calculations of potential-energy surfaces for comparison with our findings, we are unable reach a firm conclusion on the role of the second barrier upon mass division in fission.

6635 Nuclear Mass Ranges

Refer also to citation(s) 13492, 13527, 13676, 13679, 13680, 13696, 13700, 13720, 13723, 13726, 13727, 13729, 13730, 13732, 13733, 13734, 13735, 13737, 13739, 13740, 13741, 13744, 13747, 13748, 13749, 13751, 13763, 13764, 13765, 13766, 13767, 13768, 13769, 13770, 13774, 13779, 13780, 13788, 13789, 13791, 13792, 13796, 13797, 13798, 13799, 13800, 13801, 13806, 13807, 13808

6636 Radiation Physics

Refer also to citation(s) 12117, 12170, 12171, 12845, 12902, 13022, 13161, 13235, 13392, 13498, 13853, 13896, 14252

13809 (ANL/XFD/PP–76784) **Comment on: "Interference effects between independent gamma rays".** McNulty, I. (Argonne National Lab., IL (United States)); Gluskin, E.; Howells, M.R. Argonne National Lab., IL (United States). 17 Jul 1992. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008469. Source: OSTI; NTIS; INIS; GPO Dep.

In a recent letter, E. Ikonen proposed a Hanbury Brown and Twiss (HBT) intensity interferometry experiment to demonstrate interference effects between independent gamma rays. Ikonen suggests that in order to obtain a measurable correlation signal with gamma or x-radiation, it would be necessary to use a highly monochromatic beam such as that produced by a monochromator based on the Mossbauer effect, operating on a high brilliance beamline at a synchrotron storage ring. In this comment, the authors point out that, although this is a possible approach, it is unnecessary to utilize the extremely narrow bandwidth afforded by nuclear resonant monochromatization to demonstrate the HBT effect with x-rays. Furthermore, they do not agree that the proposed experiment would provide evidence of interference between independent quanta in the x-ray region, or that the results of such an experiment depend on quantum phenomena which are fundamentally different than those which apply to conventional (amplitude) interferometry.

13810 (CONF-940424–14) **The TORSED and TORSET codes for coupling three-dimensional TORT calculations.** Rhoades, W.A. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994. Order Number DE94006554. Source: OSTI; NTIS; GPO Dep.

Two new codes perform "bootstrapping" of either two- or three-dimensional boundary fluxes to a TORT three-dimensional calculation. TORSED couples a DORT RZ calculation to an XYZ TORT. Two methods of directional remapping are available, each less expensive than methods previously available for this work. TORSED is compatible with the discontinuous mesh features of TORT. The second code, TORSET, couples two XYZ TORT problems. The second problem may lie entirely inside the first, or it may touch over only a portion of its surface. TORSET can obtain most of its input data from the primary TORT problem or from an automatic mesh generator. Both codes are available for general use on Cray mainframes and UNIX workstations.

13811 (CONF-940424–20) **Adjacent-cell Preconditioners for solving optically thick neutron transport problems.** Azmy, Y.Y. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994. Order Number DE94007219. Source: OSTI; NTIS; INIS; GPO Dep.

We develop, analyze, and test a new acceleration scheme for neutron transport methods, the Adjacent-cell Preconditioner (AP) that is particularly suited for solving optically thick problems. Our method goes beyond Diffusion Synthetic Acceleration (DSA) methods in that it's spectral radius vanishes with increasing cell thickness. In particular, for the ID case the AP method converges immediately, i.e. in one iteration, to 10^{-4} pointwise relative criterion in problems with dominant cell size of 10 mfp or thicker. Also the AP has a simple formalism and is cell-centered hence, multidimensional and high order extensions are easier to develop, and more efficient to implement.

13812 (CONF-940424–22) **Implementation and display of Computer Aided Design (CAD) models in Monte Carlo radiation transport and shielding applications.** Burns, T.J. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994. Order Number DE94007221. Source: OSTI; NTIS; INIS; GPO Dep.

An Xwindow application capable of importing geometric information directly from two Computer Aided Design (CAD) based formats for use in radiation transport and shielding analyses is being developed at ORNL. The application permits the user to graphically view the geometric models imported from the two formats for verification and debugging. Previous models, specifically formatted for the radiation transport and shielding codes can also be imported. Required extensions to the existing combinatorial geometry analysis routines are discussed. Examples illustrating the various options and features which will be implemented in the application are presented. The use of the application as a visualization tool for the output of the radiation transport codes is also discussed.

13813 (DOE/ER/75711–1) **Study of neutron focusing at the Texas Cold Neutron Source: Progress report.** Wehring, B.W.; Uenlue, K. Texas Univ., Austin, TX (United States). Nuclear Engineering Teaching Lab. 28 Jan 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER75711. Order Number DE94008349. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this three year study is to develop a neutron focusing system to be used with the Texas Cold Neutron Source (TCNS) to produce an intense beam of neutrons. A prompt gamma activation analysis (PGAA) facility will also be designed, setup, and tested under this DOE grant. During the first year of the DOE grant, a new procedure was developed and used to design a focusing converging guide consisting of truncated rectangular cone sections. Detailed calculations were performed using a 3-D Monte Carlo code which the authors wrote to trace neutrons through the existing curved guide of the TCNS into the proposed converging guide. Using realistic reflectivities for Ni-Ti supermirrors, they obtained gains of 4 to 5 for the neutron flux averaged over an area of 1 x 1 cm. Two graduate students were supported by the first year of the DOE grant. Both have passed the Nuclear Engineering qualifying examination and have been admitted to candidacy for the doctoral degree at The University of Texas at Austin. Their programs of study and dissertation projects have been approved by the appropriate committees.

13814 (INIS-RU–370, pp. 45-50) **The program of group constants creation (SMOK) on basis libraries of evaluated nuclear data in ENDE/B format for physical module FORTUN-88.** Borisov, A.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The SMOK program for creation of group microconstants in the FORTUN-88 physical module format providing for calculations of neutron transport by the Monte Carlo method is described. The program processes files of evaluated neutron nuclear data in the ENDF-4 format. The constant structure gives an apportunity to simulate the process of neutron collisions with matter in details. The program service capabilities provide for graphical constant comparison. 11 refs.

13815 (ITP–92-65E) **Spin dependence of the neutron-triton scattering lengths.** Levashev, V.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 17p. Order Number DE94617047. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility to determine reliably the neutron-triton scattering lengths using the available theoretical and experimental data is

studied. It is shown that there exists an noticeable inconsistency between theoretical predictions for the triplet and singlet $n-^3$ H scattering lengths A_1 and A_0 and experimental restrictions on them imposed by the date for the total cross section and coherent scattering length. The necessity to carry out new independent experiments to measure the $n-^3$ H zero-energy cross section and coherent scattering length, notably, the incoherent $n-^3$ H scattering length is substantiated. (author). 19 refs., 1 tab., 2 figs.

13816 (LA-UR–94-204) **A nonlinear positive method for solving the transport equation on course meshes.** Walters, W.F.; Wareing, T.A. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940424–13: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94006255. Source: OSTI; NTIS; INIS; GPO Dep.

A new nonlinear S_n transport differencing scheme for slab geometry is presented that is fourth order accurate for small meshes and is strictly positive. The new scheme has been coded into the existing ONELD code and tested. Numerical results to demonstrate the accuracy and positivity of this new scheme are presented.

13817 (LA-UR–94-260) **Neutron streaming through shield ducts using a discrete ordinates/Monte Carlo method.** Urban, W.T.; Baker, R.S. Los Alamos National Lab., NM (United States). 18 Aug 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940424–15: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE94006240. Source: OSTI; NTIS; GPO Dep.

A common problem in shield design is determining the neutron flux that streams through ducts in shields and also that penetrates the shield after having traveled partway down the duct. Obviously the determination of the neutrons that stream down the duct can be computed in a straightforward manner using Monte Carlo techniques. On the other hand those neutrons that must penetrate a significant portion of the shield are more easily handled using discrete ordinates methods. A hybrid discrete ordinates/Monte Carlo cods, TWODANT/MC, which is an extension of the existing discrete ordinates code TWODANT, has been developed at Los Alamos to allow the efficient, accurate treatment of both streaming and deep penetration problems in a single calculation. In this paper we provide examples of the application of TWODANT/MC to typical geometries that are encountered in shield design and compare the results with those obtained using the Los Alamos Monte Carlo code MCNP[3].

13818 (LIYaF–1758) **Calculation of ionization loss fluctuations of fast heavy charged particles.** Smirnov, I.B. AN SSSR, Leningrad (Russian Federation). Inst. Yademoj Fiziki. 1991. 17p. (In Russian). Order Number DE94617050. Source: OSTI; NTIS (US Sales Only); INIS.

The ionization loss of the fast heavy charged particles in matter is discussed. More exact formula for the cross section of energy loss is suggested. Statistical properties of the distribution of ionization loss in thin and very thin layers of matter allow to calculate the distribution function and to model corresponding random number with large accuracy and a very small expenditure of computer time. The results of calculations correspond to experimental data. 12 refs., 2 figs., 1 tab.

13819 (NIIYaF-MGU–92-8-257) **Albedo of photons of high energetic cascade developing in semi-infinite dense matter.** Plyasheshnikov, A.V.; Khejn, L.A. Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 23p. (In Russian). Order Number DE94617051. Source: OSTI; NTIS (US Sales Only); INIS.

The calculation data on the total number as well energy, angular and space distribution of albedo photons are presented for the showers initiated by high-energy photons in semi-infinite homogeneous media.

13820 (PCCF-RI–93-08, pp. 38-39) **Spatial aspects of light ions tracks.** Michalik, V. (Ceskoslovenska Akademie Ved, Prague (Czech Republic). Institute of Radiation Dosimetry). Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In radiation biology as well as in radiation dosimetry the knowledge of radiation track structure is very important. Some recent results are summarized briefly, like simulation of track structure, double strand break correlations with energy deposition clusters, the case of two particles with the same LET and others. (R.P.) 7 refs.

13821 (PCCF-RI–93-08, pp. 40-41) **Development of a Monte Carlo code for the simulation of therapeutic proton beams.** Medin, J. (Stockholm Univ. (Sweden). Dept. of Radiation Physics); Andreo, P. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

In order to improve the present status of the dosimetry for therapeutic proton beams a Monte Carlo code is under development. The code differs from existing Monte Carlo codes for proton transport at therapeutic energies in a number of aspects. The Monte Carlo code under development, PETRA, is a Class-II type MC code where single proton-electron collisions yielding energy losses greater than a given cut-off are considered individually. (R.P.) 6 refs.; 4 figs.

13822 (PCCF-RI–93-08, pp. 42-43) **Heavy ion track structure calculations.** Kraemer, M. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Kraft, G. Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire. 1993. (CONF-9210102–: Workshop on biological applications of relativistic nuclei, Clermont-Ferrand (France), 14-16 Oct 1992). In *Proceedings of biological applications of relativistic nuclei.* 100p. Order Number DE94617841. Source: OSTI; NTIS (US Sales Only); INIS.

A Monte Carlo (MC) simulation has been developed to model the primary ionization and the transport of the created δ-electrons in matter, particular in water. Each collision of a heavy ion or an electron with a molecule is treated individually. This strategy allows to study the ionization distribution on an event-by-event basis on a nanometer scale. The dose as a function of distance from the ion path was calculated and compared with experimental results. (R.P.) 10 refs.; 2 figs.

13823 (SAND–93-2077C) **ITS Version 3.0: Powerful, user-friendly software for radiation modelling.** Kensek, R.P.; Halbleib, J.A.; Valdez, G.D. Sandia National Labs., Albuquerque, NM (United States). [1993]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940566–1: International ultraviolet and electron beam curing conference and exhibition, Orlando, FL (United States), 1-5 May 1994). Order Number DE94006607. Source: OSTI; NTIS; INIS; GPO Dep.

ITS (the Integrated Tiger Series) is a powerful, but user-friendly, software package permitting state-of-the-art modelling of electron and/or photon radiation effects. The programs provide Monte Carlo solution of linear time-independent coupled electron/photon radiation transport problems, with or without the presence of macroscopic electric and magnetic fields. The ITS system combines operational simplicity and physical accuracy in order to provide experimentalist and theorists alike with a method for the routine but rigorous solution of sophisticated radiation transport problems.

13824 (SAND–93-2084C) **Complete model description of an electron beam using ACCEPT Monte Carlo simulation code.** Weiss, D.E. (Corporate Research Process Technologies Lab., St. Paul, MN (United States)); Kensek, R.P. Sandia National Labs., Albuquerque, NM (United States). [1993]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940566–2: International ultraviolet and electron beam curing conference and exhibition, Orlando, FL

(United States), 1-5 May 1994). Order Number DE94007063. Source: OSTI; NTIS; GPO Dep.

A 3D model of a low voltage electron beam has been constructed using the ITS/ACCEPT Monte Carlo code in order to validate the code for this application and improve upon 1D slab geometry simulations. A line source description update to the code allows complete simulation of a low voltage electron beam with any filament length. Faithful reproduction of the geometric elements involved, especially the window support structure, can account for 90–95% of the dose received by routine dosimetry. With a 3D model, dose distributions in non-web articles can be determined and the effects of equipment modifications can be anticipated in advance.

13825 (SAND–93-2085C) **Modelling dose distribution in tubing and cable using CYLTRAN and ACCEPT Monte Carlo simulation code.** Weiss, D.E. (Minnesota Mining and Mfg. Co., St. Paul, MN (United States). Corporate Research Process Technologies Laboratory); Kensek, R.P. Sandia National Labs., Albuquerque, NM (United States). [1993]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940566–3: International ultraviolet and electron beam curing conference and exhibition, Orlando, FL (United States), 1-5 May 1994). Order Number DE94007064. Source: OSTI; NTIS; GPO Dep.

One of the difficulties in the irradiation of non-slab geometries, such as a tube, is the uneven penetration of the electrons. A simple model of the distribution of dose in a tube or cable in relationship to voltage, composition, wall thickness and diameter can be mapped using the cylinder geometry provided for in the ITS/CYLTRAN code, complete with automatic subzoning. The reality of more complex 3D geometry to include effects of window foil, backscattering fixtures and beam scanning angles can be more completely accounted for by using the ITS/ACCEPT code with a line source update and a system of intersecting wedges to define input zones for mapping dose distributions in a tube. Thus, all of the variables that affect dose distribution can be modelled without the need to run time consuming and costly factory experiments. The effects of composition changes on dose distribution can also be anticipated.

13826 (UCRL-ID–115525) **2D deterministic radiation transport with the discontinuous finite element method.** Kershaw, D.; Harte, J. Lawrence Livermore National Lab., CA (United States). 11 Nov 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94004687. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a complete description of the analytic and discretized equations for 2D deterministic radiation transport. This computational model has been checked against a wide variety of analytic test problems and found to give excellent results. We make extensive use of the discontinuous finite element method.

13827 (USIP–92-06) **Calculation of inelastic mean free path and stopping power for electrons in solids from an optical-data model.** Fernandez-Varea, J.M. (Facultat de Fisica (EMC), Universitat de Barcelona and Societat Catalana de Fisica (IEC), Barcelona (Spain)); Mayol, R.; Salvat, F.; Liljequist, D. Stockholm Univ. (Sweden). Dept. of Physics. Nov 1992. 27p. Order Number DE94618716. Source: OSTI; NTIS; INIS.

The numerical calculation of electron inelastic mean free path and stopping power from an optical-data model recently proposed by Fernandez-Varea et al. is described in detail. Explicit expressions for the one-electron total cross sections of the two-modes model of the free-electron gas and the δ-oscillator are derived. The inelastic mean free path and the stopping power are obtained as integrals of these one-electron total cross sections weighted by the optical as integrals of these one-electron total cross sections weighted by the optical oscillator strength. The integrals can be easily evaluated, with a selected accuracy, by using the FORTRAN 77 subroutine GABQ described here, which implements a 20-points Gauss adaptive bipartition quadrature method. Source listings of FORTRAN 77 subroutines to compute the one-electron total cross sections are also given.

6640 Atomic and Molecular Physics

Refer also to citation(s) 12669

13828 (ANL/CHM/PP–76281) **Cluster research in the framework of The Theory Institute.** Jellinek, J. Argonne National Lab., IL (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008137. Source: OSTI; NTIS; GPO Dep.

The Theory Institute was established in 1991 for studies of atomic clusters, with collaboration with theorists from national and international institutions. A summary is given of the research.

13829 (ANL/CHM/PP–80246) **A general stochastic Liouville theory for sequential and superexchange electron-transfer reactions involving three Marcus potential surfaces.** Tang, J. Argonne National Lab., IL (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007695. Source: OSTI; NTIS; GPO Dep.

A general theory for nonadiabatic electron-transfer reactions at high temperature involving Marcus parabolic potential surfaces is presented. The theory can be applied to a three-component system with a donor, a bridging intermediate and an acceptor as well as to a system with charge separation from a photo-excited state followed by charge recombination to a third or ground state. Using the nonperturbative stochastic Liouville approach, analytical expressions are derived for the superexchange and the sequential electron-transfer rate constants covering all three conditions: the "nondegenerate," the "degenerate" and the "quasi-degenerate" regimes.

13830 (DOE/ER/45415–T1) **Near edge x-ray spectroscopy theory: Annual progress report, 1993–1994.** Washington Univ., Seattle, WA (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER45415. Order Number DE94008179. Source: OSTI; NTIS; INIS; GPO Dep.

We propose to develop a quantitative theory of x-ray spectroscopies in the near edge region, within about 100 eV of threshold. These spectroscopies include XAFS (X-ray absorption fine structure), photoelectron diffraction (PD), and diffraction anomalous fine structure (DAFS), all of which are important tools for structural studies using synchrotron radiation x-ray sources. Of primary importance in these studies are many-body effects, such as the photoelectron self-energy, and inelastic losses. A better understanding of these quantities is needed to obtain theories without adjustable parameters. We propose both analytical and numerical calculations, the latter based on our x-ray spectroscopy codes FEFF.

13831 (INIS-mf–13749, pp. 92) **The determination of laser power variation using a photochemical reaction.** Golnabi, H. (Sharif Univ. of Technology, Tehran (Iran, Islamic Republic of). Inst. of Water and Energy); Samimi, H.; Massoumi, A.; Sohrabi, M.R. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 43.

Short communication. LASERS/photochemical reactions; LASERS/power; IRON COMPLEXES; LASERS; POWER; OXALATES; POTASSIUM COMPLEXES; PULSES

6641 Theory of Electronic Structure of Atoms and Molecules

Refer also to citation(s) 13777

13832 (ANL/CHM/CP–81637) **Wave packet studies of the vibrational predissociation of three and four-atom van der Waals complexes.** Gray, S.K. Argonne National Lab., IL (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9404106–1:

Royal Society of Chemistry conference, Durham (United Kingdom), 2-8 Apr 1994). Order Number DE94007623. Source: OSTI; NTIS; GPO Dep.

Vibrational predissociation of XI_2 and X_2I_2 van der Waals complexes, with X = He and Ne, is studied with wave packets. Three-dimensional calculations are carried out on the three-atom systems. Suitable X··I potential interactions are determined, and product distributions are predicted. Reduced dimension models of $X_2I_2(v') \rightarrow 2X + I_2(v < v')$ are investigated. Comparison is made with available experimental results. Mechanistic issues, including the role of intramolecular vibrational relaxation resonances, are addressed.

13833 (ANL/CHM/PP–73485) **Computational chemistry on parallel computers.** Harrison, R.J.; Shepard, R.; Wagner, A.F. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008106. Source: OSTI; NTIS; GPO Dep.

The recent successful adaptation of mainline computational chemistry codes to parallel computers introduces a new era of cost-effective, computer-intensive chemistry applications and paves the way for future applications on massively parallel centralized computers being developed under the High Performance Computer and Communications Initiative. Parallel computer architecture offers the promise of inexpensive supercomputing for the price of effort in algorithm adaptations to parallelism. In Chemical Sciences-supported work at Argonne, beginning efforts at algorithm changes in computational chemistry codes has resulted in program performances on the Group's 12-processor Alliant computer superior to that on one-processor Cray X-MP or Y-MP computers. The effort so far has focused on sophisticated and highly accurate electronic structure production codes for determining the forces between atoms and molecules responsible for chemical structure, spectra, and reactivity. Some effort has also been invested in trajectory simulations of molecular dynamics. The American-made Alliant computer (model FX/2812) is one of the latest generation of shared-memory group- or division-size computers that generally cost about an order of magnitude less than the laboratory- or university-size computers such as Crays.

13834 (DOE/ER/14236–2) **Highly excited molecular spectra: Progress report, January 1, 1992–December 31, 1992.** Kellman, M.E. Oregon Univ., Eugene, OR (United States). Dept. of Chemistry. [1992]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-92ER14236. Order Number DE94008067. Source: OSTI; NTIS; GPO Dep.

Goal is to devise new methods to analyze spectra and dynamics of highly excited vibrational states of molecules. Strong mode coupling and anharmonicity give rise to complicated classical dynamics, making the simple normal mode analysis unsatisfactory. New methods of spectral analysis, pattern recognition, and assignment are sought using techniques of nonlinear dynamics including bifurcation theory, phase space classification, and quantization of phase space structures. Emphasis in the past year has been chaotic systems and systems with many degrees of freedom.

13835 (INP–91-45) **Structure of the quantum states of hydrogen atom in magnetic field near the ionization limit.** Kuchiev, M.Yu.; Sushkov, O.P. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1991. 17p. (IYaF–91-45.). Order Number DE94617056. Source: OSTI; NTIS (US Sales Only); INIS.

Continues and discrete spectrum states near the ionization limit of hydrogen atom are considered. The origin of the continuous spectrum narrow resonances is elucidated. It is shown that the wave functions structure is intermediate between the regular structure and chaotic one. 4 refs.

13836 (ITP–93-40E) **On the effects of transforming the vibrational spectra of molecular systems under microwave radiation.** Serikov, A.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 23p. Order Number DE94617057. Source: OSTI; NTIS (US Sales Only); INIS.

This problem is analyzed within the quantum-classical theory of molecular spectra. It is shown that the above-mentioned spectrum transformation could be, in principle, realized in macromolecular systems with strong interaction, and attention is drawn to the resonance character of the effect. (author). 19 refs., 1 fig.

6642 Spectra of Atoms and Molecules and Their Interactions With Photons

13837 (CONF-9306113–2) **Electronic and nuclear factors in intramolecular charge and excitation transfer processes: [Annual report], October 1992–September 1993.** Piotrowiak, P. New Orleans Univ., LA (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-92ER14310. From 17. solar photochemistry research conference; Brainerd, MN (United States); 6-10 Jun 1993. Order Number DE94006598. Source: OSTI; NTIS; GPO Dep.

A qualitative discussion is given of initial work on the following topics: intramolecular triplet excitation transfer bands, donor–bridge–acceptor systems with a tethered ion, and depolarization of transient microwave conductivity. A number of special compounds were synthesized, such as spiranes, 2,6-diamino-dihydroanthracene precursor, and para-amino-nitro-biphenyl and -terphenyl.

13838 (DOE/ER/13590–13) **Ionization probes of molecular structure and chemistry: Progress report, January 15, 1993–January 14, 1994.** Johnson, P.M. State Univ. of New York, Stony Brook, NY (United States). Jan 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13590. Order Number DE94007605. Source: OSTI; NTIS; GPO Dep.

The development of new techniques for the study of chemical systems is vital for progress in understanding commercially and environmentally important chemical reactions such as combustion, atmospheric ozone depletion, chemical etching in semiconductor manufacture, etc. The very high light flux obtainable from current tunable lasers enables the user to obtain a diagnostic response from molecules present in extremely small concentrations. It is the goal of this research to understand the photophysics of molecule-laser interactions and to devise new spectroscopic analysis techniques which tell us more about the molecules and enable their detection in difficult environments. With high powered pulsed lasers, an almost inevitable end product of the molecule-laser interaction is ionization of the molecule via the absorption of one or several photons. This provides an opportunity for detection because it is easy to collect and count ions. The challenge is to extract information from the ionization event, which typically does not convey the spectral signatures which allow detailed characterization. The author is presently exploiting the very high Rydberg states present just below the energy of each ionic state as referenced to the neutral ground state. By creating and field ionizing these Rydberg states, he is able to extract the states of the molecular ion from the continuum absorption. When he detects the resulting ion in a mass spectrometer, he calls the technique Mass Analyzed Threshold Ionization (MATI) spectroscopy. The information obtained from the experiment is equivalent to having an infrared spectrum of the ion responsible for each parent mass peak in a mass spectrometer sampling a mixture. The identity and structure of each species can be determined. The bulk of the effort in the last year has been involved with understanding the detailed mechanism of this technique and extending it to allow different light sources.

13839 (ETDE-IT–94-31) **Sub-Doppler infrared spectroscopy of NO and N_2O in supersonic expansion.** Snels, M. (Consiglio Nazionale delle Ricerche, Potenza (Italy). Ist. per Materiali Speciali); Di Palma, T.; Orlando, S.; Fantoni, R.; Giardini-Guidoni, A. No corporate text available. 1993. 3p. (CONF-9305331–1: 15. international symposium on molecular beams, Berlin (Germany), 16-21 May 1993). Order Number DE94752568. Source: OSTI; NTIS (US Sales Only).

Within the framework of experimental studies on a new diode laser molecular jet apparatus, sub-Doppler spectra of NO and N_2O were measured in a planar supersonic jet. Different experimental methods for obtaining jet spectra will be presented and illustrated with examples. The presence of small clusters in the expansion will be investigated.

13840 (GSI–93-27) **Transient magnetic fields of H-like ions in the range $10 \leq Z_{ion} \leq 28$.** Cub, J. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik. Jul 1993. 95p. (In German). Order Number DE94747631. Source: OSTI; NTIS (US Sales Only); INIS.

Experiments with the hydrogen-like ions Ne-20, S-32, Ar-40, Fe-54 and Ni-62 were performed in order to measure the transient magnetic fields of the ions by perturbed angular correlation of the gamma radiation.

13841 (INIS-BR–3261) **Studies on atom deceleration process by using the Zeeman-tuned technique.** Bagnato, V.S. Sao Paulo Univ., Sao Carlos, SP (Brazil). Inst. de Fisica e Quimica. 1990. 124p. (In Portuguese). Order Number DE94618731. Source: OSTI; NTIS (US Sales Only); INIS.

The Zeeman-tuned technique to slow an atomic beam of sodium atoms was detailed studied. A new technique to study the deceleration which consists in monitoring the fluorescence along the deceleration path is used. This allows a direct observation of the process and open possibilities to investigate the adiabatic following of atoms in the magnetic field, and others very important aspects of the process. With a single laser and some modification of the magnetic field profile it is possible stop atoms outside the slower solenoid, which make a lot of experiments much simpler. A systematic study of the optical pumping effects and adiabatic following conditions allow to produce a very strong slow motion atomic beam. (author).

13842 (INIS-mf–13749) **Abstracts of 2. international conference on lasers and their applications.** Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

The following topics are presented at 2. international conference on lasers and their applications in Iran: laser principle and technology, laser applications in spectroscopy; nonlinear optics; industry; medicine; and laser related techniques.

13843 (INIS-mf–13749, pp. 2) **Application of laser spectroscopy.** Demtroeder, W. (Kaiserslautern Univ. (Germany). Fachbereich Physik). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER SPECTROSCOPY/uses; CHEMICAL ANALYSIS; USES; OPTICAL RADAR; RESOLUTION; SENSITIVITY

13844 (INIS-mf–13749, pp. 40) **New method of high-resolution laser spectroscopy on the basis of flight effects of particles.** Izmailov, A.Ch. (AN Azerbajdzhanskoj SSR, Baku (Azerbaijan). Inst. Fiziki). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. LASER SPECTROSCOPY/resolution; RESOLUTION; RAREFIED GASES

13845 (INIS-mf–13749, pp. 41-42) **Lifetimes-measurements of selectively excited molecular levels.** Mehdizadeh, E. (Shahid Bahonar Univ., Kerman (Iran, Islamic Republic of). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CESIUM/lifetime; SODIUM/lifetime; CESIUM; LIFETIME; COINCIDENCE METHODS; ENERGY-LEVEL TRANSITIONS; EXCITED STATES; FLUORESCENCE; LASER SPECTROSCOPY; LINE WIDTHS; MODE LOCKING; MOLECULES; OPTICAL PUMPING; SODIUM

13846 (INIS-mf–13749, pp. 43) **On the mechanisms of the laser optogalvanic (L O G) signal production in N_2 discharge.** Tadjalli, H. (Tabriz Univ., (Iran, Islamic Republic of). Dept. of Physics); Sobhanian, S.; Telue, B. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 12.

Short communication. EXCITATION/nitrogen; NITROGEN/laser spectroscopy; RECOMBINATION/nitrogen; EXCITATION; NITROGEN; MOLECULES; NITROGEN IONS; RECOMBINATION

13847 (INIS-mf–13749, pp. 44) **High resolution IR diode laser and fourier Transform spectroscopy of molecules.** Bannai, R.A. (University of Bahrain (Bahrain). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. OXIMES/rotational states; OXIMES/vibrational states; FOURIER TRANSFORM SPECTROMETERS; INFRARED RADIATION; MOLECULES; OXIMES; RESOLUTION; SEMICONDUCTOR DIODES

13848 (INIS-mf–13749, pp. 46) **The study of spectral line profiles in excimer molecules.** Golnabi, H. (Sharif Univ. of Technology, Tehran (Iran, Islamic Republic of). Institute of Water and Energy); Rambod, R.; Massoumi, A. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 14.

Short communication. CESIUM/excimer lasers; KRYPTON/excimer lasers; CESIUM; ENERGY-LEVEL TRANSITIONS; FORBIDDEN TRANSITIONS; KRYPTON; SPECTRA

13849 (INIS-mf–13749, pp. 48) **Use of seeded Nd:Y A G lasers for high resolution spectroscopy.** Harrison, J.A. (Oregon State Univ., Corvallis, OR (United States). Dept. of Chemistry); Zahedi, M.; Nibler, J.W. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. RAMAN SPECTROSCOPY/resolution; CARBON DIOXIDE; FERMI RESONANCE; HYPERFINE STRUCTURE; IODINE; LINE WIDTHS; MHZ RANGE 01-100; NEODYMIUM LASERS; POLARIZATION; PULSES; RESOLUTION

13850 (INIS-mf–13749, pp. 57) **The contribution of nonlinear absorption to laser-induced damage in metal glasses.** Mansour, N. (Shahid Beheshti Univ., Teheran (Iran, Islamic Republic of). Physics Dept.); Soileau, M.J.; Van Stryland, E.W. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of).

Laser Research Center. 1993. 137p. (CONF-9308213--: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. METALLIC GLASSES/absorption; METALLIC GLASSES/laser radiation; BREAKDOWN; ABSORPTION; PULSES; WAVELENGTHS

13851 (INIS-mf--13749, pp. 61) **Third-order optical nonlinearity in organic multi-component systems.** Rahnama, F. (Calcutta Univ. (India). Dept. of Applied Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213--: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. EOSIN/nonlinear optics; ERYTHROSINE/nonlinear optics; FLUORESCEIN/nonlinear optics; ABSORPTION SPECTRA; EOSIN; ERYTHROSINE; FLUORESCEIN

13852 (INIS-mf--13749, pp. 62) **Deactivation of two-photon excited Xe (5 p^5 6 p, 6 p', 7 p) and Kr(4 p^5 5 p) in Xenon and krypton.** Pournasr, H. (Texas Univ., Austin, TX (United States). Dept. of Physics); Whitehead, C.A.; Keto, J.W. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213--: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 22.

Short communication. KRYPTON/avalanche quenching; XENON/avalanche quenching; EXCITED STATES; KRYPTON; LIFETIME; XENON

13853 (INIS-mf--13749, pp. 68-69) **Photothermal deflection and lensing spectroscopy: Theoretical development.** Zandi, M.H. (Isfahan Univ., (Iran, Islamic Republic of). Dept. of Physics); Soltanolkotabi, M. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213--: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 25-26.

Short communication. LASER SPECTROSCOPY; LASER RADIATION; REFRACTIVE INDEX

13854 (INIS-mf--13749, pp. 78-79) **Design of a new method using lasers for setting up the exact level structure of the isotopes far from stability.** Rastikerdar, S. (Isfahan Univ., (Iran, Islamic Republic of). Physics Dept.). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213--: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 31-32.

Short communication. TIN 101/laser radiation; ENERGY LEVELS; GAMMA SPECTRA; PARITY; SPECTRAL SHIFT; SPIN; TIN ISOTOPES

13855 (INIS-mf--13780, pp. 57) **Investigating the effect of electric field on shifting of absorption spectra in air and S F_6 gas.** Malek fer, R. (Tehran Teacher Traning Univ., (Iran, Islamic Republic of) Dept. of Physics); Besam, M.A.; Bagheri, S.A. Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219--: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ABSORPTION SPECTRA/electric fields; AIR; SULFUR FLUORIDES

13856 (JINR-R--4-93-198) **Direct photoionization of excited helium.** Danzan, S.; Zhadamba, B.; Lkhagva, O.; Strakhova, S.I.; Sukhbaatar, Ts. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 22p. (In Russian). Order Number DE94618732. Source: OSTI; NTIS (US Sales Only); INIS.

The sensitivity of direct photoionization characteristics of the excited helium to the inclusion of the closed channels and to the choice of the structure models of the continuum and initial states in an energy region below the resonances converging to the second threshold is investigated. 37 refs.; 6 figs.; 5 tabs.

13857 (JINR-R--4-93-199) **Resonance photoionization of the excited helium.** Danzan, S.; Zhadamba, B.; Sukhbaatar, Ts.; Lkhagva, O.; Strakhova, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 22p. (In Russian). Order Number DE94618733. Source: OSTI; NTIS (US Sales Only); INIS.

The influence of the closed channel on the structure formation of the autoionization resonance in the photoionization of the excited He is investigated. 30 refs.; 5 figs.; 14 tabs.

13858 (LYCEN--9138) **Intensity of two-photon absorption transitions for Ni^{2+} in MgO.** Sztucki, J. (Technische Hochschule Darmstadt (Germany). Inst. fuer Festkoerperphysik); Daoud, M.; Kibler, M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. 22 Jul 1991. 17p. Order Number DE94618734. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, B (US).

The parity-allowed two-photon transitions between the ground state $^3A_2(T_2)$ of the configuration $3d^8$ in cubical symmetry and the excited states of the same configuration are obtained via a simple model. This model is developed in a symmetry adapted framework by using second-order mechanisms and ionic wave-functions. It is applied to the recent experimental results obtained by McClure and co-workers for Ni^{2+} in MgO. (author) 21 refs.; 2 tabs.

13859 (LYCEN--9307) **Sum rules for multi-photon spectroscopy of ions in finite symmetry.** Kibler, M.; Daoud, M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. May 1993. 16p. Order Number DE94618735. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Letters in Mathematical Physics (NL).

Models describing one- and two-photon transitions for ions in crystalline environments are unified and extended to the case of parity-allowed and parity-forbidden p-photon transitions. The number of independent parameters for characterizing the polarization dependence is shown to depend on an ensemble of properties and rules which combine symmetry considerations and physical models. (author) 26 refs.

6643 Collision Phenomena

Refer also to citation(s) 13386, 13932

13860 (ANL/CHM/PP--76357) **Formation mechanism and yield of molecules ejected from ZnS, CdS, and FeS_2 during ion bombardment.** Nikzad, S. (Argonne National Lab., IL (United States)); Calaway, W.F.; Pellin, M.J.; Young, C.E.; Gruen, D.M.; Tombrello, T.A. Argonne National Lab., IL (United States). [1994]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008487. Source: OSTI; NTIS; INIS; GPO Dep.

Neutral species ejected from single crystals of ZnS, CdS, and FeS_2 during ion bombardment by 3 keV Ar^+ were detected by laser post-ionization followed by time-of-flight mass spectrometry. While metal atoms (Fe, Zn, Cd) and S_2 were the dominant species observed, substantial amounts of S, FeS, Zn_2, ZnS, Cd_2, and CdS were also detected. The experimental results demonstrate that molecules represent a larger fraction of the sputtered yield than

was previously believed from secondary ion mass spectrometry experiments. In addition, the data suggest that the molecules are not necessarily formed from adjacent atoms in the solid and that a modified form of the recombination model could provide a mechanism for their formation.

13861 (CEA-CONF–11451) **Calculation of alignment in H^++ He electron capture collisions.** Pascale, J. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules); Lundy, C.J.; Olson, R.E.; Schultz, D.R. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules. 1993. 1p. (CONF-930711–: 18. international conference on the physics of electronic and atomic collisions, Aarhus (Denmark), 21-27 Jul 1993). Order Number DE94618746. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ELECTRON CAPTURE/ion-atom collisions; ION-ATOM COLLISIONS/helium; ION-ATOM COLLISIONS/protons; HELIUM IONS; ION SCATTERING ANALYSIS; HELIUM; PROTONS; KEV RANGE 10-100; KEV RANGE 100-1000; MONTE CARLO METHOD; NUCLEAR ALIGNMENT; TRAJECTORIES

13862 (DOE/ER/13442–8) **Energy transfer properties and mechanisms: Technical progress report, 1 March 1991–15 August 1993.** Barker, J.R. Michigan Univ., Ann Arbor, MI (United States). [1993]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER13442. Order Number DE94007403. Source: OSTI; NTIS; INIS; GPO Dep.

Since no single experimental technique is the best method for energy transfer experiments, we have used both time-dependent infrared fluorescence (IRF) and time-dependent thermal lensing (TDTL) to study energy transfer in various systems. We are investigating pump-probe techniques employing resonance enhanced multiphoton ionization (REMPI). IRF was used to study benzene, azulene, and toluene. TDTL was used to study CS_2 and SO_2 (data not given for latter). Large molecule energy transfer mechanisms are discussed. 10 figs.

13863 (ITP–93-4E) **Modelling of the structure and physical properties of simple disordered systems.** Zagorodnij, A.G.; Gerasimov, O.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 21p. Order Number DE94617087. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical modelling of a set of Bogolyubov distribution functions and self-consistent(within the Bogolyubov theory) interatomic potentials are proposed for the appraisals and calculations of many-particle contributions to structural, thermodynamic and polarisation al properties of the disordered systems. (author). 17 refs., 1 tab., 2 figs.

13864 (JINR-R–4-93-200) **The angular and energy distributions of ejected electrons in electron-impact ionization of helium.** Lkhagva, O.; Khehnmehdehkh, L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1993. 19p. (In Russian). Order Number DE94618748. Source: OSTI; NTIS (US Sales Only); INIS.

The angular and energy distributions of ejected electrons in the direct He(e,2e)He^+ reaction are studied. It is shown that the first Born approximation is applicable for the description of ejected electrons for incident electron energies $E_0 \geq 500$ eV at arbitrary ejection angles. Furthermore, it is shown that the anisotropy of ejected electrons and the predominance of higher order multipole terms give rise to differences in the angular distributions of double differential cross sections for different kinematic conditions. 23 refs.; 9 figs.; 3 tabs.

13865 (JINR-R–14-93-247) **On the shape of X-ray spectra excited by heavy ions.** Altynov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1993. 15p. (In Russian). Order Number DE94618747. Source: OSTI; NTIS (US Sales Only); INIS.

Some physical factors determining the shape of X-ray Spectra excited in collisions with heavy ions are considered. It is concluded that (1) the substantial broadening of multiple ionization satellites at the increase of the emitter atomic number is caused by the Doppler effect and complication of their multiple structure; (2) the presence of velocity in the target atom as well as the incident ions field do not influence the position of the satellites center of gravity; (3) for correct interpretation of experimental data one has to take into account a possible overlapping of components of neighbouring satellites. 15 refs.; 4 figs.; 1 tab.

13866 (LYCEN–9320) **Fast negative helium ions produced by double electron capture in single He^+ - He collision.** Ouaskit, S. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Farizon, M.; Farizon-Mazuy, B.; Gaillard, M.J.; Gerlic, E.; Stern, M.; Clouvas, A.; Katsanos, A. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Apr 1993. 14p. Order Number DE94618749. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, A (General Physics) (US).

Fast (0.35-1.2 MeV) He^- ions produced by double electron capture have been observed in the He^+ - He collision. The thickness of the gas jet target (4.10^{13} to 10^{15} at/cm^2) has been calculated without any separate calibration. Single collision conditions have allowed a direct measurement of the total cross section of the double electron capture. These data can be related to the development of theoretical studies on double electron capture. (author) 20 refs.; 3 figs.; 1 tab.

6644 Experimentally Derived Information On Atomic and Molecular Properties

Refer also to citation(s) 13932

13867 (ANL/PHY/CP–81852) **Elimination of two atomic electrons by a single high energy photon.** Amusia, M.Y. (Argonne National Lab., IL (United States)); Ioffe, A.F. Argonne National Lab., IL (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9310281–1: Eliminations of two atomic electrons by single high energy photon, Argonne, IL (United States), 4-5 Oct 1993). Order Number DE94006834. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics: mechanism of two-electron photoionization; multiple photoionization near inner shell thresholds; double ionization accompanying compton-effect; and the investigation of secondary photon emission in coincidence with double charged ion production.

13868 (INIS-BR–3257) **The dynamics of hydrogen atoms dissolved in Zr Cr_2 alloy.** Moura, J.I. de. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1992. 94p. (In Portuguese). Order Number DE94618756. Source: OSTI; NTIS (US Sales Only); INIS.

The localized vibration modes of hydrogen in the Zr Cr_2 H_x compound were studied for three hydrogen concentrations, namely x=0.45, 2 and 3, by inelastic neutron scattering with the beryllium filter-time of flight facility installed at the IEA-R1 research reactor at IPEN-CNEN/SP. It was observed four frequencies of localized hydrogen vibrations, three of which with 28 MeV full width at a half maximum (FWHM) at neutron energy transfers of 184, 151 and 134 MeV with no perceptible changes as a function of hydrogen concentration. The fourth mode is observed at neutron energy transfer of 106 MeV for x=o.45 and x=2 whereas it decreases to 98 MeV for x=3. (author).

13869 (INIS-mf–13749, pp. 30-31) **The simulation of nitrogen laser for optimization of the output powers in different vibrational C-B transitions.** Parvin, P. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of). Laser Research Center); Sadighi, R.; Zaeferaani, M.S.; Zare, A.; Bagheri, P.; Karaherudi, H. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 7-8.

Short communication. LASERS/computerized simulation; STIMULATED EMISSION/optimization; ELECTRIC CONDUCTIVITY;

LASERS; NITROGEN; POPULATION INVERSION; OPTIMIZATION; TIME DELAY; VIBRATIONAL STATES

13870 (INIS-mf–13749, pp. 66-67) **Coherence time of scattered laser signal propagating through water.** Sheybani, E. (South Florida Univ., FL (United States). Engineering Lab.). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the second part of the document on p. 23-24.

Short communication. LASER RADIATION/coherent scattering; LINE WIDTHS; SIGNALS; SPECTRAL DENSITY; WATER; WAVE PROPAGATION

13871 (INIS-mf–13780, pp. 54) **Study of optical anisotropic conductivity of Ga Se crystal under intense optical excitations.** Tajalli, H. (Tabriz Univ., (Iran, Islamic Republic of) Dept. of Physics); Kalafi, M.; Bidadi, H.; Salmanov, V. Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. GALLIUM SELENIDES/anisotropy; GALLIUM SELENIDES/optical properties; CRYSTALS; ELECTRIC FIELDS; ANISOTROPY; LASER RADIATION

13872 (LA-UR–94-695) **Fluorescence detection of single molecules using pulsed near-field optical excitation and time correlated photon counting.** Ambrose, W.P.; Goodwin, P.M.; Martin, J.C.; Keller, R.A. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940142–21: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007553. Source: OSTI; NTIS; INIS; GPO Dep.

Pulsed excitation, time correlated single photon counting and time gated detection are used in near-field optical microscopy to enhance fluorescence images and measure the fluorescence lifetimes of single molecules of Rhodamine 6G on silica surfaces. Time gated detection is used to reject prompt scattered background and to improve the image signal to noise ratio. The excited state lifetime of a single Rhodamine 6G molecule is found to depend on the position of the near-field probe. We attribute the lifetime variations to spontaneous emission rate alterations by the fluorescence reflected from and quenching by the aluminum coated probe.

13873 (LYCEN–9117) **Symmetry adaptation and two-photon spectroscopy of ions in molecular or solid-state finite symmetry.** Kibler, M.; Daoud, M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. 5 Jul 1991. 14p. (CONF-9107276–: 5. Workshop on symmetry methods in physics, Obninsk (Russian Federation), 8-12 Jul 1991). Order Number DE94618757. Source: OSTI; NTIS (US Sales Only); INIS.

Finite symmetry adaptation techniques are applied to the determination of the intensity strength of two-photon transitions for ions with one partly-filled shell nl in crystalline environments of symmetry G. The case of intra-configurational ($nl^N \rightarrow nl^N$) transitions as well as the case of inter-configurational ($nl^N \rightarrow nl^{N-1}n'l'$ with $(-)^{l+l'}=-1$) transitions is treated. In both cases, the Wigner-Racah algebra of the chain O(3) contains G allows to extract the polarization dependence from the intensity. The reported results are valid for any strength of the crystalline field. (author) 19 refs.

6645 Special Atoms and Molecules

13874 (INS–1014) **First observation of laser-induced resonant annihilation in metastable antiprotonic helium atoms.** Morita, N. (Okazaki National Research Inst., Aichi (Japan). Inst. for Molecular Science); Kumakura, M.; Yamazaki, T. Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study. Nov 1993. 13p. Order Number DE94748668. Source: OSTI; NTIS; INIS.

We have observed the first laser-induced resonant transitions in antiprotonic helium atoms. These occur between metastable states and Auger dominated short lived states, and show that the anomalous longevity of antiprotons previously observed in helium media results from the formation of high-n high-l atomic states of p-barHe$^+$. The observed transition with vacuum wavelength 597.259 $\pm$ 0.002 nm and lower-state lifetime 15 $\pm$ 1 ns is tentatively assigned to (n,l) = (39,35) $\rightarrow$ (38,34). (author).

13875 (JINR–2-93-59, pp. 65-74) **The first results of the muonium to antimuonium conversion experiment at Dubna phasotron.** Abazov, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Aleshin, N.P.; Baranov, V.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. In *JINR rapid communications: Collection.* 115p. Order Number DE94618106. Source: OSTI; NTIS (US Sales Only); INIS.

The muonium to antimuonium conversion experiment with use of the intensive surface muons of Dubna phasotron. This muon beam has been achieved by means of a wide-angle magnetic lens. The new method has been used of identify muonium to antimuonium conversion with high probability of M $\rightarrow$ M-bar process and lower background. The first results of this experiment are described. No events of the M $\rightarrow$ M-bar conversion were observed. The upper limit for the branching ratio of the process investigated with respect to normal muon decay is measured to be $W_{MM-b}ar < 3.9x10^{-7}$ (90% confidence level). This result is a factor of 1.7 better than the previous experimental limit. The new value for the coupling constant of the M $\rightarrow$ M-bar conversion process is $G_{MM-b}ar$ 0.13xG_F (90 confidence level). 12 refs.; 4 figs.

13876 (KFK–5122) **Muon induced reactions in the KARMEN neutrino detector.** Grandegger, W. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Kernphysik; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Physik. Feb 1993. 163p. (In German). Order Number DE94745997. Source: OSTI; NTIS (US Sales Only); INIS.

This report deals with the detailed study of muon induced reactions in the KARMEN detector system. However such reactions are not only background for neutrino events: The precise measurement of muon capture and muon decay reactions allows to determine and test a variety of detector properties and efficiencies and to check corresponding Monte-Carlo simulations. Furthermore important results for the structure of weak hadronic currents could be deduced by measuring muon capture on carbon. The muon charge ratio was determined by fitting the time distribution of muon decays in the KARMEN detector: $R(\mu^+/\mu^-)=1.32\pm0.05$. This allowed a precise determination of the capture rate of negative muons on ^{12}C: $\Lambda_c{}^{12}C(\mu^-,\nu_\mu)^{12}B=(6.86\pm0.59).10^3\ s^{-1}$, which is in good agreement with the best experimental value of $\Lambda_c=(7.05\pm0.27).10^3\ s^{-1}$ measured in 1964. For the first time a capture rate for the rare process $\mu^-+{}^{13}C\rightarrow{}^{12}B+n+\nu_\mu$ could be extracted: $\Lambda_c{}^{13}C(\mu^-,\nu_\mu n)^{12}B=(21.9\pm3.9).10^3\ s^{-1}$, which is about 30% lower than theoretically expected. Effective methods for background reduction have been deduced from the detailed study of muon induced background reactions which make it possible to observe the 15 MeV γ-rays from the neutral neutrino nucleus excitation $^{12}C(\nu,\nu')^{12}C^*$ with a signal-to-background ratio better than 2:1. Extended Monte-Carlo-Simulations with GEANT3 have been performed for neutrino and muon induced reactions in the KARMEN detector. The measured energy and spatial distributions of the muon induced reactions are in good agreement with the calculated ones thus verifying the good properties of the KARMEN detector. Therefore reliable results can also be expected for the neutrino induced reactions. (orig./HSI)

6650 Physics of Condensed Matter

Refer also to citation(s) 13414, 14246

13877 (ANL/MSD/PP–71900) **On the relation between sliding and migration of symmetrical tilt grain boundaries.** Wolf, D.; Phillpot, S.R.; Jaszczak, J.A.; Rickman, J.M.; Yip, S. Argonne

National Lab., IL (United States). Feb 1991. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008118. Source: OSTI; NTIS; GPO Dep.

We demonstrate that, based on their unique geometry, the migration of all symmetrical and certain asymmetrical tilt grain boundaries is necessarily accompanied by sliding parallel to the interface. By contrast, for all other types of grain boundaries no crystallographic necessity exists for migration to be coupled with sliding. Except in the case of the coherent (111) twin boundary in the fcc lattice, the coherently-twinned translational configuration is identified as the saddle-point configuration for the migration of the symmetrical tilt boundaries.

13878 (ANL/MSD/PP–74972) **Simulated quenching in the grand-canonical ensemble.** Phillpot, S.R.; Rickman, J.M. Argonne National Lab., IL (United States). Dec 1991. 22p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007672. Source: OSTI; NTIS; GPO Dep.

A formalism for obtaining the zero-temperature structure of mono- component solids in the grand-canonical ensemble is developed. The new methodology, grand-canonical simulated quenching, is validated by simulating systems initially containing a vacancy and an interstitial. As a first application, the reconstruction of a high-angle twist grain boundary in fcc Cu is investigated.

13879 (DOE/ER/13714–T2) **[Molecular interactions in dilute supercritical mixtures: Molecular dynamics investigation]: Final technical report, December 1, 1990–August 31, 1993.** Debenedetti, P.G. Princeton Univ., NJ (United States). Dept. of Chemical Engineering. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13714. Order Number DE94007610. Source: OSTI; NTIS; GPO Dep.

Research was done in the following areas: computational and theoretical studies of molecular interactions in supercritical mixtures; supercooled liquids, network fluids, and glasses; and fast algorithms for simulating large systems on a vector processor.

13880 (DOE/ER/40561–114) **Cold cluster ferromagnetism.** Bertsch, G.F. (Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory); Yabana, K. Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94007264. Source: OSTI; NTIS; INIS; GPO Dep.

We examine the magnetic moment distribution of ferromagnetic clusters under conditions where the magnetic moment is aligned with the internal cluster axis. Analytic expressions are obtained for the moment distribution and the adiabatic average moment induced in low fields. The result differs from the low-field Langevin function by a factor 2/3.

13881 (DOE/ER/45197–8) **Numerical simulation of quantum many-body systems: Progress report for March 1, 1991–September 1, 1993.** Scalapino, D.J.; Sugar, R.L. California Univ., Santa Barbara, CA (United States). Dept. of Physics. [1993]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-85ER45197. Order Number DE94008451. Source: OSTI; NTIS; INIS; GPO Dep.

Understanding the physical properties of strongly interacting many-electron systems remains one of the central goals of condensed matter physics. In this project, the authors have developed and implemented numerical techniques, such as quantum Monte Carlo simulations, to study basic models of interacting electrons: the one-band Hubbard model for positive and negative U, the three-band CuO_2 Hubbard model, the Holstein electron-phonon model, the periodic Anderson model, and the Kondo lattice. Such models exhibit a rich variety of physical properties. For example, the half-filled Holstein model undergoes a Peierls-charge-density wave transition. While away from half-filling there is competition between superconductivity and the Peierls-charge-density wave phase. The ground state of the half-filled 2D Hubbard model has long-range antiferromagnetic order. Away from half-filling, it has been found to have an attractive interaction in the singlet $d_{x^2-y^2}$ pairing channel, and it provides a model for the high-temperature cuprate superconductors. Similarly, it is believed that the periodic Anderson model and the Kondo lattice model provide a framework for understanding the heavy fermion materials which can exhibit antiferromagnetic and superconducting phases. Because of the strong coupling and the interplay between the different correlations, it is possible to tip these delicately balanced systems in favor of a given correlated state by the approximations one makes. Thus it is important to develop systematic, controlled calculations for these models. Numerical calculations provide an important approach for determining the properties of such models. A review of the work on these problems is presented.

13882 (DOE/ER/45372–6) **Energetics, bonding mechanism and electronic structure of ceramic/ceramic and metal/ceramic interfaces: Annual progress report, April 1, 1993–March 31, 1994.** Freeman, A.J. Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy. [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER45372. Order Number DE94008551. Source: OSTI; NTIS; GPO Dep.

Objectives were to study theory of structure of the metal/ceramic interface (heterophase ceramic interfaces), ferroelectronic materials and their epitaxially grown oxide thin films (superlattice structure), perovskites, antiferroelectric and electro-optic materials, etc.

13883 (INIS-mf–13749, pp. 60) **'Running' grating at four-wave mixing in photo refractive crystals.** Rustamov, F.A. (Baku State Univ., (Azerbaijan). Physics Dept.); Sadykhov, E.A.; Gamidov, R.G.; Ibragim, M.A.V. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. BISMUTH OXIDES/diffraction gratings; DIFFRACTION GRATINGS/frequency mixing; SILICON OXIDES/diffraction gratings; CRYSTALS; NONLINEAR OPTICS; VELOCITY

13884 (INIS-mf–13749, pp. 136) **InP/InGaAsP/InGaAs avalanche photodiode (APD).** Zand, M. (Atomic Energy Organization of Iran, Tehran (Iran, Islamic Republic of) Laser Research Center); Hajghassem, H.; Noshirvani, M.; Karbalayi-Hossein, H.; Attar, N.; Salemi, S.; Ghorab, F. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTODIODES/townsend discharge; EPITAXY; FABRICATION; GALLIUM ARSENIDES; INDIUM ARSENIDES; INDIUM PHOSPHIDES; PERFORMANCE; PHOTODIODES

13885 (INIS-mf–13780, pp. 57-58) **Measurement of optical parameters of FeS_2 semiconductor crystal by reflection of infrared radiation method by using of Kramers-Kronig integrals at low temperature.** Talabian, M. (Urmia Univ., (Iran, Islamic Republic of) Faculty of Science). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PYRITE/optical modes; PYRITE/refractive index; CRYSTALS; DAMPING; FREQUENCY MEASUREMENT; INFRARED RADIATION; PYRITE; REFLECTION; SEMICONDUCTOR MATERIALS; TEMPERATURE RANGE 0065-0273 K

13886 (LA-UR–93-3467) **A high performance communications and memory caching scheme for molecular dynamics on the CM-5.** Beazley, D.M.; Lomdahl, P.S.; Gronbech-Jensen, N.; Tamayo, P. Los Alamos National Lab., NM (United States). 15 Sep 1993. 16p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-7405-ENG-36. (CONF-940451–1: Parallel processing symposium, Cancun (Mexico), 26-29 Apr 1994). Order Number DE94000682. Source: OSTI; NTIS; GPO Dep.

In this paper, we provide a brief overview of our general molecular dynamics algorithm and focus on several performance enhancements that have allowed us to achieve high performance on the CM-5. Our use of the CM-5 vector units (VUs) to calculate forces is described along with a memory caching scheme that speeds up the force calculation by as much as 50%. In addition, we discuss a method used to speed up the communication aspects of our algorithm by more than 35%. Lastly, recent timing and scaling results are presented. Our code has been implemented in ANSI C with explicit calls to the CMMD message-passing library. To use the VUs we have written our force calculation in CDPEAC (a C interface to the VU assembler language, DPEAC). We also assume that particles interact according to the Lennard-Jones 6–12 (LJ) potential.

13887 (SAND–93-2702C) **Advances in MOVPE compound semiconductor epitaxy manufacturing technology: From high throughput large area reactors to cluster tools.** Tompa, G.S. (Emcore Corp., Somerset, NJ (United States)); Zawadzki, P.A.; Moy, K. Sandia National Labs., Albuquerque, NM (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940588–1: 1994 conference on GaAs manufacturing, Las Vegas, NV (United States), 2-5 May 1994). Order Number DE94006367. Source: OSTI; NTIS; GPO Dep.

Short communication. SEMICONDUCTOR MATERIALS/vapor phase epitaxy; PRODUCTION; FABRICATION

13888 (SAND–94-0317C) **Chemisorbed-molecule potential-energy surfaces and electronically- stimulated processes.** Jennison, D.R. (Sandia National Labs., Albuquerque, NM (United States)); Stechel, E.B.; Burns, A.R.; Li, S.Y. Sandia National Labs., Albuquerque, NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940142–22: OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering, Los Angeles, CA (United States), 22-29 Jan 1994). Order Number DE94007932. Source: OSTI; NTIS; INIS; GPO Dep.

Three topics illustrate some central physics of processes produced by UV-laser and low-energy electron stimulation. First, a multi-dimensional ground-state potential energy surface (PES) for NH_3: Pd(111), computed using ab initio local-density functional theory, allows dramatically different dynamics depending on poorly-known excited-state forces. We use quantum-resolved experimental data to argue that stimulated desorption is dominated by a direct path off the surface, following placement of the wavepacket on a molecule-surface hard wall accessed by internal molecular motion. This illustrates the questionable relevance of one-dimensional models for understanding molecule-surface dynamics. Second, we study the image-charge model of excited state forces experienced by ions produced, for example, by hot carrier attachment. Ab initio results show that this model totally fails at molecule-surface distances typical of chemisorption. Finally, we present a purely-electronic adiabatic model of excited state PESs and use it to argue that, if significant covalent interactions occur between an adsorbate and a surface, hot carrier attachment does not simply produce singly-charged ions. Instead, attachment creates excitations of the molecule-surface bond occur and, in some cases, may result in multiply-charged ions.

13889 (UCRL-ID–115869) **Notes on the Langevin model for turbulent diffusion of "marked" particles.** Rodean, H.C. Lawrence Livermore National Lab., CA (United States). 26 Jan 1994. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94007847. Source: OSTI; NTIS; GPO Dep.

Three models for scalar diffusion in turbulent flow (eddy diffusivity, random displacement, and on the Langevin equation) are briefly described. These models random velocity increment based Fokker-Planck equation is introduced as are then examined in more detail in the reverse order. The Fokker-Planck equation is the Eulerian equivalent of the Lagrangian Langevin equation, and the derivation of e outlined. The procedure for obtaining the deterministic and stochastic components of the Langevin equation from Kolmogorov's 1941 inertial range theory and the Fokker-Planck equation is described. it is noted that a unique form of the Langevin equation can be determined for diffusion in one dimension but not in two or three. The Langevin equation for vertical diffusion in the non-Gaussian convective boundary layer is presented and successively simplified for Gaussian inhomogeneous turbulence and Gaussian homogeneous turbulence in turn. The Langevin equation for Gaussian inhomogeneous turbulence is mathematically transformed into the random displacement model. It is shown how the Fokker-Planck equation for the random displacement model is identical in form to the partial differential equation for the eddy diffusivity model. It is noted that the Langevin model is applicable in two cases in which the other two are not valid: (1) very close in time and distance to the point of scalar release and (2) the non-Gaussian convective boundary layer. The two- and three-dimensional cases are considered in Part III.

13890 (UCRL-JC–115625) **Femtosecond probe-probe transmission studies of LT-grown GaAs near the band edge.** Radousky, H.B.; Bello, A.F.; Erskine, D.J.; Dinh, L.N.; Bennahmias, M.J.; Perry, M.D.; Ditmire, T.R.; Mariella, R.P. Jr. Lawrence Livermore National Lab., CA (United States). Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940411–1: Spring meeting of the Materials Research Society, San Francisco, CA (United States), 4-8 Apr 1994). Order Number DE94006660. Source: OSTI; NTIS; GPO Dep.

We have studied the near-edge optical response of a LT-grown GaAs sample which was deposited at 300°C on a Si substrate, and then annealed at 600°C. The Si was etched away to leave a 1 micron free standing GaAs film. Femtosecond transmission measurements were made using an equal pulse technique at four wavelengths between 825 and 870 nm. For each wavelength we observe both a multipicosecond relaxation time, as well as a shorter relaxation time which is less than 100 femtoseconds.

13891 (UCRL-JC–115806) **Analytic properties of the OCP and ionic mixtures in the strongly coupled fluid state.** DeWitt, H.E. Lawrence Livermore National Lab., CA (United States). 2 Dec 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309148–1: 7. international workshop on the physics of nonideal plasmas, Rostock (Germany), 27 Sep - 1 oct 1993). Order Number DE94008216. Source: OSTI; NTIS; INIS; GPO Dep.

Exact results for the Madelung constants and first order anharmonic energies are given for the inverse power potentials with the Coulomb potential as the softest example. Similar exact results are obtained using the analysis of Rosenfeld on the $\Gamma \rightarrow \infty$ limit for the OCP internal energy, direct correlation function, screening function, and bridge functions. Knowing these exact limits for the fluid phase of the OCP allows one to determine the nature of the thermal corrections to the strongly coupled results. Solutions of the HNC equation modified with the hard sphere bridge function give an example.

6651 Nuclear Techniques in Condensed Matter Physics

Refer also to citation(s) 11473, 12614, 12981, 13868, 13921

13892 (CEA-CONF–11444) **Experiments on melting in classical and quantum two dimensional electron systems.** Williams, F.I.B. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Recherche sur l'Etat Condense, les Atomes et les Molecules. 1991. 9p. (CONF-910838–: International conference on physics in two dimensions, Neuchatel (Switzerland), 19-23 Aug 1991; SPEC–91-078.). Order Number DE94618824. Source: OSTI; NTIS (US Sales Only); INIS.

"Two dimensional electron system" (2DES) here refers to electrons whose dynamics is free in 2 dimensions but blocked in the third. Experiments have been performed in two limiting situations: the classical, low density, limit realised by electrons deposited on a liquid helium surface and the quantum, high density, limit realised

by electrons at an interface between two epitaxially matched semiconductors. In the classical system, where $T_Q << V_c$ so that the thermodynamic state is determined by the competition between the temperature and the Coulomb interaction, melting is induced either by raising the temperature at constant density or by lowering the density at finite temperature. In the quantum system, it is not possible to lower the density below about $100n_W$ without the Coulomb interaction losing out to the random field representing the extrinsic disorder imposed by the semiconductor host. Instead one has to induce crystallisation with the help of the Lorentz force, by applying a perpendicular magnetic field B[2]. As the quantum magnetic length l_c = (Planck constant c/eB)$^{1/2}$ is reduced with respect to the interelectronic spacing a, expressed by the filling factor ν $2l_c^2/a^2$, the system exhibits the quantum Hall effect (QHE), first for integer then for fractional values of ν. The fractional quantum Hall effect (FQHE) is a result of Coulomb induced correlation in the quantum liquid, but as ν is decreased still further the correlations are expected to take on long-range crystal-like periodicity accompanied by elastic shear rigidity. Such a state can nonetheless be destroyed by the disordering effect of temperature, giving rise to a phase boundary in a (T, B) plane. The aim of experiment is first to determine the phase diagram and then to help elucidate the mechanism of the melting. (author).

13893 (INIS-BR–3250) **Site populations analysis of the $Sm_2(Co,Fe)_{17}$ alloys using Moessbauer spectroscopy.** Nagamine, L.C.C.M. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 69p. (In Portuguese). Order Number DE94618825. Source: OSTI; NTIS (US Sales Only); INIS.

Moessbauer measurements were carried out at room temperature for $Sm_2(Co_{1-x}\ Fe_x)_{17}$ alloys with x=0,1 to 0,6 and $Sm_2(Co_{0.9-v}\ Fe_v\ Cu_{0.08}\ Zr_{0.02})_{8.35}$, with v=0.23 to 0.27. All samples were characterized by x-ray diffraction. They showed rhombohedral structure of $Th_2\ Zn_{17}$ type (R 3-bar m), where Fe atoms occupy four crystallographic sites. All spectra showed magnetic splitting and a high complexity resulting from the superposition of four Fe sites. Hyperfine parameters and site populations were obtained by least-squares fitting of the spectra. (author).

13894 (INIS-mf–13749, pp. 111-112) **Deposition of materials thin films by pulsed laser evaporation technique.** Kordi-Ardakani, H. (Poona Univ., Pune (India). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THIN FILMS/evaporation; THIN FILMS/laser radiation; DEPOSITION; LASER MATERIALS; PULSES; EVAPORATION

13895 (INIS-mf–14177) **Development of a high-resolution backscatter spectrometer for inelastic X-ray scattering measurement: Final report.** Peisl, J.; Burkel, E. Muenchen Univ. (Germany). Sektion Physik. 1989. 9p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03PE1LMU. Order Number DE94752433. Source: OSTI; NTIS (US Sales Only); INIS.

Considerable progress has been achieved in the reporting period in the development of the INELAX instrument for high-resolution detection of X-ray scattering. Apart from the further development of the focussing devices, an improved design of the instrument has been installed in the HARWI X-ray wiggler. Inelastic measurements have been successfully performed in the X-ray test rig, yielding measured results on photons scattered by pyrolytic graphite and beryllium and, after a modification of the instrument, measurements with a diamond have been likewise successful. (orig.)

13896 (JAERI-M–93-228) **Proceedings of the fifth international symposium on advanced nuclear energy research: Neutrons as microscopic probes.** Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 1101p. (CONF-9303258–: 5. international symposium on advanced nuclear energy research, Mito (Japan), 10-12 Mar 1993; JAERI-CONF–2). Order Number DE94748692. Source: OSTI; NTIS; INIS.

Composed of two volumes.

This issue is the collection of the papers presented at the title meeting. The 142 of the presented papers are indexed individually. (J.P.N.).

13897 (LBL–34882) **Applications of highly spin-polarized xenon in NMR.** Long, H.W. (Univ. of California, Berkeley, CA (United States). Dept. of Chemistry). Lawrence Berkeley Lab., CA (United States). Sep 1993. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007037. Source: OSTI; NTIS; GPO Dep.

The main goal of the work presented in this thesis is produce highly spin-polarized xenon to create much greater signal intensities (up to 54,000 times greater) so as to allow studies to be made on systems with low surface area and long spin-lattice relaxation times. The spin-exchange optical pumping technique used to create high nuclear spin polarization is described in detail in chapter two. This technique is initially applied to some multiple-pulse optically detected NMR experiments in low magnetic field (50G) that allow the study of quadrupoler interactions with a surface of only a few square centimeters. In chapter three the apparatus used to allow high field ^{129}Xe NMR studies to be performed with extremely high sensitivity is described and applied to experiments on diamagnetic susceptibility effects in thin (~2000 layers) films of frozen xenon. Preliminary surface investigations of laser polarized ^{129}Xe adsorbed an a variety of materials (salts, molecular crystals, amorphous carbon, graphite) are then discussed. A full detailed study of the surface of a particular polymer, poly(acrylic acid), is presented in chapter four which shows the kind of detailed information that can be obtained from this technique. Along with preliminary results for several similar polymers, a summary is given of xenon studies of a novel ultra-high surface area polymer, poly(triarylcarbinol). Finally in chapter five the exciting possibility of transferring the high spin order of the laser polarized xenon has been used to transfer nuclear spin order to $^{13}CO_2$ in a xenon matrix and to protons on poly(triarylcarbinol).

13898 (LBL–34883) **Advances and applications of dynamic-angle spinning nuclear magnetic resonance.** Baltisberger, J.H. Lawrence Berkeley Lab., CA (United States). Jun 1993. 219p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007031. Source: OSTI; NTIS; INIS; GPO Dep.

This dissertation describes nuclear magnetic resonance experiments and theory which have been developed to study quadrupolar nuclei (those nuclei with spin greater than one-half) in the solid state. Primarily, the technique of dynamic-angle spinning (DAS) is extensively reviewed and expanded upon in this thesis. Specifically, the improvement in both the resolution (two-dimensional pure-absorptive phase methods and DAS angle choice) and sensitivity (pulse-sequence development), along with effective spinning speed enhancement (again through choice of DAS conditions or alternative multiple pulse schemes) of dynamic-angle spinning experiment was realized with both theory and experimental examples. The application of DAS to new types of nuclei (specifically the ^{87}Rb and ^{85}Rb nuclear spins) and materials (specifically amorphous solids) has also greatly expanded the possibilities of the use of DAS to study a larger range of materials. This dissertation is meant to demonstrate both recent advances and applications of the DAS technique, and by no means represents a comprehensive study of any particular chemical problem.

13899 (LNS–171) **Investigations into the fast ionic conductors γ-CuBr, Li_2S, Na_2S, Ba_2NH, $NaTaN_2$ and Li_3HoCl_6 by means of neutron scattering.** Altorfer, F. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)). Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Neutronenstreuung. Jan 1994. 102p. (In German). Order Number DE94618826. Source: OSTI; NTIS; INIS.

The main topic of this work was the investigation of ionic diffusion in solids by means of neutron scattering. Experiments were carried out on the antifluorites Li_2S, Na_2S and γ-CuBr (zinc-blende type) as well as on Barium-Nitride-Hydride Ba_2NH, $NaTaN_2$ and Li_3HoCl_6 which represent three-and two-dimensional ionic conductors, respectively. In the sulphur based antifluorites Li_2S and Na_2S the occupation of the interstitial empty cube site by cations occurs

at elevated temperatures. The temperature-dependence of the diffusion process has been investigated by quasielastic, incoherent neutron scattering. The cations hop between their regular lattice sites and the interstitial empty cube site, whereas the sulphur ions vibrate in good approximation harmonically even at high temperatures. The jump vectors define a three-dimensional net of possible cation paths through the crystal. The analysis of quasielastic scattering experiments on a Li_2S single crystal enabled us to determine the jump vectors and the jump rates $1/\tau$. The temperature dependence of the anharmonic contributions to the copper structure factor was the main point in our neutron diffraction experiments on γ-CuBr. It could be shown that the copper density function deviates strongly from the isotropic form with increasing temperature. Barium-Nitride-Hydride is one of the few documented H^--ionic conductors. The electronic part of the ds-conductivity is only 1/ 10000 of the ionic contribution. Since Ba_2NH is a layer compound, where H^- and N^{3-} layers alternate along the c-axis, the probability of jumps out of the plane is suppressed in favour of in plane jumps. This compound is therefore a model system in which two-dimensional diffusion can be studied and in fact the analysis of the quasielastic data proved that the H-diffusion is caused by jumps between regular H^- lattice sites. (author) figs., tabs., refs.

13900 (SAND–93-2429C) **Novel failure analysis techniques using photon probing with a scanning optical microscope.** Cole, E.I. Jr.; Soden, J.M.; Rife, J.L.; Barton, D.L.; Henderson, C.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940453–3: International reliability physics symposium, San Jose, CA (United States), 11-14 Apr 1994). Order Number DE94006594. Source: OSTI; NTIS; GPO Dep.

Three new failure analysis techniques for integrated circuits (ICs) have been developed using localized photon probing with a scanning optical microscope (SOM). The first two are light-induced voltage alteration (LIVA) imaging techniques that (1) localize open-circuited and damaged junctions and (2) image transistor logic states. The third technique uses the SOM to control logic states optically from the IC backside. LIVA images are produced by monitoring the voltage fluctuations of a constant current power supply as a laser beam is scanned over the IC. High selectivity for localizing defects has been demonstrated using the LIVA approach. Logic state mapping results, similar to previous work using biased optical beam induced current (OBIC) and laser probing approaches have also been produced using LIVA. Application of the two LIVA based techniques to backside failure analysis has been demonstrated using an infrared laser source. Optical logic state control is based upon earlier work examining transistor response to photon injection. The physics of each method and their applications for failure analysis are described.

6653 Interactions Between Beams and Condensed Matter

Refer also to citation(s) 13376, 13827, 14190

13901 (ANL/APS/PP–73889) **Observation of the traveling component of an x-ray standing wave field.** Lai, B.; Yun, W.B.; Chrzas, J.; Viccaro, P.J. Argonne National Lab., IL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007671. Source: OSTI; NTIS; INIS; GPO Dep.

We present the first systematic experimental study of the traveling component of a standing wave field, formed by interference of an incident beam with its specularly reflected part from a plane interface. The traveling component of the standing wave field propagates parallel to the interface and its existence manifests the dynamical aspect of the standing wave field. In our experiment, a multilayer structure was used to aid in the observation of the traveling wave component. The data measured are explained using a finite thickness diffraction grating model.

13902 (CEA-CONF–11448) **Damage generation by electronic excitations in crystalline metals.** Dunlop, A.; Lesueur, D. CEA-Ecole Polytechnique, 91 - Palaiseau (France). Lab. d'Etudes des Solides Irradies. 1992. 5p. (CONF-921101–: 16. Materials Research Society (MRS) fall meeting, Boston, MA (United States), 30 Nov - 5 dec 1992). Order Number DE94618847. Source: OSTI; NTIS (US Sales Only); INIS.

This paper will give a rapid overview of the main experimental results concerning the effects of high electronic energy deposition in metallic targets and present a tentative model based on the Coulomb explosion mechanism. More detailed reviews have been made recently concerning both the experiments and the theoretical model. High levels of localized energy deposition in electronic excitation are easily obtained using GeV heavy ions which during their slowing-down typically transfer a few keV/A to the electronic system of the target and a few eV/A in elastic collisions with target nuclei. In insulators and organic materials, it is well-known that both slowing-down processes contribute to damage creation, whereas in metals it has been claimed for a long time that the sole nuclear collisions are involved in damage processes. Although this last assertion remains true for some metals such as Cu, Ag, W, Cu_3 Au...[2], high levels of electronic excitation can induce a partial annealing of the defects resulting from nuclear collisions in Fe, Ni, Nb, Pt..., lead to additional defect creation in Fe, Co, Zr, Ti...[2] or even to phase transformations in $NiZr_2$ [5], Ni_3B [6], NiTi [7], Ti [8]... In the following, we shall only focus on the last two effects. (author). 15 refs.

13903 (INIS-BR–3256) **Study of thermoluminescence in K Cl crystals doped with Sr^{2+}.** Russo, D.M.B. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. 1990. 90p. (In Portuguese). Order Number DE94618848. Source: OSTI; NTIS (US Sales Only); INIS.

An attempt is made to correlate the F and Z_1 (F center modified by the presence of a two-valence impurity pair and and positive ion vacancy) and a V center, with the T L curve peaks observed in pure K Cl crystals doped with Sr^{2+}, irradiated at room temperature. (L.C.J.A.).

13904 (INIS-mf–13749, pp. 80) **Application of laser quenching in glassy metals production.** Habibi, S. (Atomic Energy Organization of Iran Tehran (Iran, Islamic Republic of). Laser Reseach Center); Banaei, N.; Jalali, S.M.; Javidi, S.; Ghorannevis, M.; Gupta, A.; Soudmand, H. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 34.

Short communication. METALLIC GLASSES/laser radiation; METALLIC GLASSES/quenching; COPPER; DEPOSITION; IRON; LAYERS; QUENCHING; SILICON; SUBSTRATES

13905 (INIS-RU–361) **Proceedings of 21. All-Union conference on physics of charged particles interaction with crystals: Part 1. Physics of orientational effects.** Tulinov, A.F.; Khodyrev, V.A. (eds.). Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki. 1992. 174p. (In Russian). (CONF-9105436–: 21. all-union conference on physics of charged particles interaction with crystals, Moscow (Russian Federation), 27 May 1991). Order Number DE94615768. Source: OSTI; NTIS (US Sales Only); INIS.

The proceedings consist of four parts covering the following subjects: physics of orientational effects; electron and positron radiation in solids; some issues of ion implantation; beams use under materials composition and structure analysis.

13906 (LA–12628-MS) **Particle-In-Cell (PIC) code simulation results and comparison with theory scaling laws for photoelectron-generated radiation.** Dipp, T.M. (Los Alamos National Lab., NM (United States)). Los Alamos National Lab., NM (United States). Dec 1993. 80p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94006132. Source: OSTI; NTIS; GPO Dep.

The generation of radiation via photoelectrons induced off of a conducting surface was explored using Particle-In-Cell (PIC) code

computer simulations. Using the MAGIC PIC code, the simulations were performed in one dimension to handle the diverse scale lengths of the particles and fields in the problem. The simulations involved monoenergetic, nonrelativistic photoelectrons emitted normal to the illuminated conducting surface. A sinusoidal, 100% modulated, 6.3263 ns pulse train, as well as unmodulated emission, were used to explore the behavior of the particles, fields, and generated radiation. A special postprocessor was written to convert the PIC code simulated electron sheath into far-field radiation parameters by means of rigorous retarded time calculations. The results of the small-spot PIC simulations were used to generate various graphs showing resonance and nonresonance radiation quantities such as radiated lobe patterns, frequency, and power. A database of PIC simulation results was created and, using a nonlinear curve-fitting program, compared with theoretical scaling laws. Overall, the small-spot behavior predicted by the theoretical scaling laws was generally observed in the PIC simulation data, providing confidence in both the theoretical scaling laws and the PIC simulations.

13907 (LA–12629-MS) **Analysis of Dietz's single, rectangular pulse theory for the generation of radiation via photoelectrons.** Dipp, T.M. Los Alamos National Lab., NM (United States). Dec 1993. 57p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94006131. Source: OSTI; NTIS; INIS; GPO Dep.

The generation of radiation via photoelectrons induced off of a conducting surface has been analytically modeled and computationally simulated by several researchers. This paper analyzes and compares Dietz's theory predictions with my research to form a unified foundation of consistent, inter-supporting results that should provide confidence in the independently performed basic research and resulting scaling laws and predictions. In doing so, this paper concentrated on Dietz's small-spot, single, rectangular, "weak" pulse theory and equations, which involve nonrelativistic, monoenergetic photoelectrons emitted normal to a conducting surface in vacuum. In this paper I: (1) analytically compare Dietz's theory equations with my theory equations, (2) compare Dietz's theoretical scaling laws with my Particle-In-Cell (PIC) code simulation results, and (3) make Dietz's equations easier to use in predicting and optimizing photoelectron-generated radiation. As a result, it is shown that Dietz's equations match my theory's equations in their predicted scaling laws, differing only slightly in their coefficients and unique model parameters. Also, Dietz's equations generally agree with the PIC code results. Finally, optimization analysis showed that theoretical conversion efficiencies for typical real metals can meet and exceed values of 10^{-5} if optimal photon energies of 15 to 20 eV are used. Even better efficiencies should be possible if the small-spot constraint is violated as well.

13908 (LA–12674) **A simple model for determining photoelectron-generated radiation scaling laws.** Dipp, T.M. (Los Alamos National Lab., NM (United States)). Los Alamos National Lab., NM (United States). Dec 1993. 76p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE94006130. Source: OSTI; NTIS; INIS; GPO Dep.

The generation of radiation via photoelectrons induced off of a conducting surface was explored using a simple model to determine fundamental scaling laws. The model is one-dimensional (small-spot) and uses monoenergetic, nonrelativistic photoelectrons emitted normal to the illuminated conducting surface. Simple steady-state radiation, frequency, and maximum orbital distance equations were derived using small-spot radiation equations, a $\sin^2$ type modulation function, and simple photoelectron dynamics. The result is a system of equations for various scaling laws, which, along with model and user constraints, are simultaneously solved using techniques similar to linear programming. Typical conductors illuminated by low-power sources producing photons with energies less than 5.0 eV are readily modeled by this small-spot, steady-state analysis, which shows they generally produce low efficiency ($\eta_{reL} < 10^{-10.5}$) pure photoelectron-induced radiation. However, the small-spot theory predicts that the total conversion efficiency for incident photon power to photoelectron-induced radiated power can go higher than $10^{-5.5}$ for typical real conductors if photons having energies of 15 eV and higher are used, and should go even higher still if the small-spot limit of this theory is exceeded as well. Overall, the simple theory equations, model constraint equations, and solution techniques presented provide a foundation for understanding, predicting, and optimizing the generated radiation, and the simple theory equations provide scaling laws to compare with computational and laboratory experimental data.

13909 (LAL-RT–93-04) **Some results of simulation on radiation effects in crystals.** Baier, T. (Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire). Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. May 1993. 19p. Order Number DE94618849. Source: OSTI; NTIS (US Sales Only); INIS.

Simulations concerning radiation in oriented silicon and tungsten crystals of different thicknesses are developed. Conditions are those of experiments done at Kharkov (Ukraine) and Tomsk (Russia) with electron beams in the 1 GeV range. Systematic comparisons between experimental and simulated spectra associated to real spectrum, radiation energy and angular distribution of the photons are developed. The ability of the simulation program to describe crystal effects in the considered energy range is analysed. (author) 11 refs.; 8 figs.

13910 (LYCEN–9319) **Secondary emission of negative ions and electrons resulting from electronic sputtering of cesium salts: Differences between halides and oxygenated salts.** Allali, H.; Nsouli, B.; Thomas, J.P. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Apr 1993. 20p. Order Number DE94618850. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to International Journal of Mass Spectroscopy and Ion Processes.

Secondary ion emission of negative ions and electrons from alkali salts bombarded with high energy (9 MeV) Ar^{+++} is discussed. Quite different features are observed according to the nature of the salt investigated (halide or oxygenated). In the case of cesium, the electron emission from halides is characterized by intense electron showers (several hundred electrons) with narrow distributions in intensity and orientation. Conversely, for oxygenated salts, these distributions are broader, much less intense (one order of magnitude), and the ion emission exhibits an dissymmetry, which has never been observed for inorganics. This last result is interpreted in terms of radiolysis of the oxygenated salt, a process well documented for gamma-ray irradiation, but not yet reported in secondary ion emission. (author) 17 refs.; 10 figs.

6654 Quantum Physics Aspects of Condensed Matter

Refer also to citation(s) 12577

13911 (DOE/ER/14162–3) **Theoretical studies of electron transfer and optical spectroscopy: Progress report, September 25, 1990–January 31, 1994.** Friesner, R.A. Columbia Univ., New York, NY (United States). Dept. of Chemistry. [1993]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14162. Order Number DE94006985. Source: OSTI; NTIS; GPO Dep.

Progress has been made in three areas. First, we have made major strides in developing our PSGVB electronic structure code, including high level electron correlation methods needed to treat complex structures like semiconductor clusters. Secondly, we have developed a one-electron pseudopotential model for semiconductor clusters which reproduces the experimental bandgap as a function of cluster size without adjustable parameters. We are currently using the model to calculate absorption spectra as opposed to just the bandgap via a dispersed polaron formalism. Finally, we have developed two novel quantum dynamical methods, one involving surface hopping and the second utilizing Redfield theory. These methods will be applied to calculation of the relaxation of an excited electron is a semiconductor cluster and also to electron transfer through DNA.

13912 (INIS-mf–14180) **The equilibrium magnetization of granular high temperature superconductors in low fields. Pt. 1: The Meissner effect of $YBa_2(Cu_{1-x}Fe_x)_3O_{7-y}$.** Ruppel, S.; Michels, G.; Geus, H.; Kalenborn, J.; Schlabitz, W.; Wohlleben, D. Koeln Univ. (Germany). 2. Physikalisches Inst. 10 Apr 1990. 24p.

Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 13N5494. Order Number DE94747578. Source: OSTI; NTIS (US Sales Only); INIS.

We report the temperature and field dependence of the Meissner flux expulsion of sintered pellets of $YBa_2(Cu_{1-x}Fe_x)_3O_{7-y}$ with $0 \leq x \leq 0.08$. In all samples the flux expulsion remains incomplete (-4 $\pi\chi \approx 1/3$) down to fields, which are much smaller than H_{c1}, but for $H \leq 2$ Oe they all finally exhibit a full Meissner effect and are therefore fully superconducting. The expulsion in 2 Oe decreases to near 30% by aging of the grain boundaries and goes back to near 100% after their reoxidation, all at a fixed and sharp T_c of 93 K. The data are interpreted in terms of equilibrium properties of granular high temperature superconductors on the basis of an analysis, which is described in detail in the following paper. An average cross-section of the superconducting 'grains' in the CuO planes of 4 μm^2 is extracted from the temperature and field dependence of the spontaneous flux expulsion. These 'grains' lie within the much larger crystallographic grains and are bordered by planar defects. Superconducting loops around these planar defects are responsible for the final flux expulsion in $H < 2$ Oe. An intrinsic transition width ΔT_c can also be extracted from the data. One finds $\Delta T_c \leq 1$ K in the orthorhombic phase ($x \leq 0.02$), while in the quasitetragonal phase, ΔT_c increases from 1 to 16 K for $0.02 < x \leq 0.08$. (orig.)

665410 Superconductivity

Refer also to citation(s) 12354, 12409, 12473, 12576, 12862, 12926

13913 (ANL/ES/RP–82004) **Preliminary investigation of force-reduced superconducting magnet configurations for advanced technology applications.** Bouillard, J.X. Argonne National Lab., IL (United States). Dec 1992. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007657. Source: OSTI; NTIS; GPO Dep.

The feasibility of new high-field low specific weight superconducting magnet designs using force-free fields is being explored analytically and numerically. This report attempts to assess the technical viability of force-free field concepts to produce high-field, low specific weight and large bore volume magnets, which could promote the use of high temperature superconductors. Several force-free/force-reduced magnet configurations are first reviewed, then discussed and assessed. Force-free magnetic fields, fields for which the current flows parallel to the field, have well-known mathematical solutions extending upon infinite domains. These solutions, however, are no longer force-free everywhere for finite geometries. In this preliminary study, force-free solutions such as the Lundquist solutions truncated to a size where the internal field of the coil matches an externally cylindrical magnetic field (also called a Lundquist coil) are numerically modeled and explored. Significant force-reduction for such coils was calculated, which may have some importance for the design of lighter toroidal magnets used in thermonuclear fusion power generation, superconducting magnetic energy storage (SMES), and mobile MHD power generation and propulsion.

13914 (ANL/MSD/CP–82054) **Short coherence length superconductors: Intermediate regime between BCS and bosons.** Engelbrecht, J.R. (Los Alamos National Lab., NM (United States)); Randeria, M.; Sa de Melo, C.A.R. Argonne National Lab., IL (United States). Feb 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931247–7: Strongly correlated electron materials, Los Alamos, NM (United States), 15-18 Dec 1993). Order Number DE94007694. Source: OSTI; NTIS; INIS; GPO Dep.

In order to understand the high T_c materials, conventional superconductors and their metallic normal states are examined to see how generalizations of BCS pairing may lead to unconventional properties. The persistence of gap-like features in the normal state up to temperatures several times T_c is pointed out. The short coherence length and normal state pseudo-gaps are suggestive of preformed pairs which Bose condense at the superconducting transitions; the normal state is a degenerate Fermi system in which correlations lead to pseudo-gaps. It is argued that these deviations from Fermi liquid behavior are characteristic of the normal state of short coherence length superconductors.

13915 (ANL/MSD/CP–82165) **High T_c superconductor tunnel junctions for photon detectors.** Zasadzinski, J. (Illinois Inst. of Tech., Chicago, IL (United States)); Chen, Jun; Gray, K.E.; Hinks, D.G. Argonne National Lab., IL (United States). Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DMR 91-20000. (CONF-940132–2: International conference on millimeter and submillimeter waves, San Diego, CA (United States), 10-14 Jan 1994). Order Number DE94007686. Source: OSTI; NTIS; GPO Dep.

SIN and SIS quasiparticle tunnel junctions on high T_c superconductors (HTS) offer the possibility of low-noise, heterodyne, photon detection in the THz regime. We report progress on the development of such junctions using mechanical point contacts. In general, these contacts display the optimum characteristics that can be obtained from HTS native-surface tunnel barriers. The bismuthate, $Ba_{1-x}K_xBiO_3$, (T_c=25K) displays ideal, BCS, quasiparticle characteristics at T=4.2 K however, at temperatures $T \sim T_c/2$ there is evidence of strong quasiparticle damping which may inhibit device performance. The cuprates typically display non-ideal quasiparticle characteristics including large sub-gap conductances. Recent data for the new Hg-based cuprates (T_c96K) are promising in that they exhibit very low and flat sub-gap conductances as expected from a BCS density of states. Proximity effect tunnel junctions on $Bi_2Sr_2CaCu_2O_8$/Au bilayers have been studied using an In tip. An induced energy gap has been consistently observed in the Au layer and the data can be understood using the McMillan model. A few junctions show much improved sub-gap characteristics compared to ones made directly on the BSCCO surface and indicate that this approach may be suitable for mixer development.

13916 (ANL/MSD/PP–73288) **Landau quantization and superconductivity at high magnetic fields.** Norman, M.R. (Argonne National Lab., IL (United States)); Akera, H.; MacDonald, A.H. Argonne National Lab., IL (United States); Cincinnati Univ., OH (United States). May 1991. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; FG02-86ER45247. (CONF-9105151–10: Physical phenomena at high magnetic fields, Tallahassee, FL (United States), 15-18 May 1991). Order Number DE94008124. Source: OSTI; NTIS; GPO Dep.

Recently, the possibility of superconducting for fields stronger than the semiclassical H_{c2} due to Landau quantization has been raised again. In this paper, the theory of such a state is reviewed for both 2D and 3D systems. We explicitly discuss the effects of impurities and Zeeman splitting. A critical analysis of the possibility of observing this reentrant behavior in real materials is given. Finally, solutions of the mean field gap equations (Bogoliubov-deGennes equations) in the quantum limit are presented and discussed in regards to their flux lattice structure.

13917 (ITP–93-16E) **Distance dependent fractional statistics in a P, T-invariant model.** Gorbar, E.V.; Mashkevich, S.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 9p. Order Number DE94617360. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that in the P,T-invariant model of high-temperature superconductivity with the mixed Chen-Simons term the interaction of charge carriers leads to effective changing of their statistics, which depends on distance between them. In particular, in the limit of large distances fermions effectively turn into bosons. (author). 17 refs.

13918 (ITP–93-18E) **Temperature dependence of superconduction bands in HTSC.** Ermakov, V.N.; Ponezha, E.A. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. Order Number DE94617361. Source: OSTI; NTIS (US Sales Only); INIS.

We develop a superconductivity theory in the one-dimensional case proceeding from the representation on the phonon mechanism of current carrier pairing which is different from the Cooper one. The temperature dependence of the superconduction gap and also its ratio to the critical temperature are calculated. The latter is shown to be essentially different from BCS theory. The results are compared with the values obtained in experiments with high-temperature superconductors. (author). 19 refs., 2 figs.

13919 (LA-UR–94-538) **Quantum fluctuations of vortices in Josephson-coupled superconductors.** Bulaevskii, L.N.; Maley, M.P. Los Alamos National Lab., NM (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940121–3: Superconducting superlattices and multilayers and oxide superconductory physics and nanoengineering, Los Angeles, CA (United States), 23-28 Jan 1994). Order Number DE94007609. Source: OSTi; NTIS; INIS; GPO Dep.

The effect of quantum fluctuations of vortices on the low temperature specific heat and reversible magnetization in the mixed state in highly anisotropic layered superconductors is discussed. For reversible magnetization, M, the change of slope in the dependence of M vs ln B, observed in Bi(2:2:1:2), is explained. In the mean, field approach this slope should be almost B independent. The specific heat due to the vortex fluctuation contribution is predicted to be linear in T at low T.

13920 (LA-UR–94-563) **Strongly anisotropic s-wave vs d-wave gap in cuprate superconductors: Evidence and theory.** Brandow, B. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-931247–8: Strongly correlated electron materials, Los Alamos, NM (United States), 15-18 Dec 1993). Order Number DE94007579. Source: OSTI; NTIS; INIS; GPO Dep.

As is well known, the d-wave gap scenario for cuprate superconductors has strong support from several lines of evidence: (1) evidence for strong gap anisotropy, e.g. the Stanford photoemission data; (2) evidence for gap nodes, e.g. the UBC studies of penetration depth $\lambda_L(T)$ at low $T(<<T_c)$; (3) a pairing interaction based on the strong quasiparticle repulsion at $q = (\pi,\pi)$, the latter being clearly established from inelastic neutron scattering and NMR data; and, (4) the phenomenological theory also provides a source for the strong (and linear) resistivity. The d-wave gap scenario and theory are therefore very plausible. The authors now point out that there is a viable alternative scenario – a highly anisotropic s-like gap form – which is also consistent with the evidence just mentioned. This form is supported by additional experimental evidence, and by a qualitative dynamical argument, and also by detailed and nearly ab initio calculations based on a systematic theory. This theory is based on the assumption of strong electronic correlations of the type found in valence-fluctuation and heavy-fermion materials.

13921 (LBL–34880) **Methyl quantum tunneling and nitrogen-14 NQR NMR studies using a SQUID magnetic resonance spectrometer.** Black, B.E. (Univ. of California, Berkeley, CA (United States). Dept. of Chemistry). Lawrence Berkeley Lab., CA (United States). Jul 1993. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94007038. Source: OSTI; NTIS; GPO Dep.

Nuclear Magnetic Resonance (NMR) and Nuclear Quadrupole Resonance (NQR) techniques have been very successful in obtaining molecular conformation and dynamics information. Unfortunately, standard NMR and NQR spectrometers are unable to adequately detect resonances below a few megahertz due to the frequency dependent sensitivity of their Faraday coil detectors. For this reason a new spectrometer with a dc SQUID (Superconducting Quantum Interference Device) detector, which has no such frequency dependence, has been developed. Previously, this spectrometer was used to observe ^{11}B and ^{27}Al NQR resonances. The scope of this study was increased to include ^{23}Na, ^{51}V, and ^{55}Mn NQR transitions. Also, a technique was presented to observe ^{14}N NQR resonances through cross relaxation of the nitrogen polarization to adjacent proton spins. When the proton Zeeman splitting matches one nitrogen quadrupoler transition the remaining two ^{14}N transitions can be detected by sweeping a saturating rf field through resonance. Additionally, simultaneous excitation of two nitrogen resonances provides signal enhancement which helps to connect transitions from the same site. In this way, nitrogen-14 resonances were observed in several amino acids and polypeptides. This spectrometer has also been useful in the direct detection of methyl quantum tunneling splittings at 4.2 K. Tunneling, frequencies of a homologous series of carboxylic acids were measured and for solids with equivalent crystal structures, an exponential correlation between the tunneling frequency and the enthalpy of fusion is observed. This correlation provides information about the contribution of intermolecular interactions to the energy barrier for methyl rotation.

13922 (SAND–94-0158) **Development, characterization, and applications of high temperature superconductor nanobridge Josephson junctions.** Wendt, J.R. (Sandia National Labs., Albuquerque, NM (United States)); Tigges, C.P.; Hietala, V.M.; Plut, T.A.; Martens, J.S.; Char, K.; Johansson, M.E. Sandia National Labs., Albuquerque, NM (United States). Mar 1994. 25p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. Contract F19628-90-C-0149. Order Number DE94008113. Source: OSTI; NTIS; GPO Dep.

A well-controlled, high-yield Josephson junction process in high temperature superconductors (HTS) is necessary for the demonstration of ultra-high-speed devices and circuits which exceed the capabilities of conventional electronics. The authors developed nanobridge Josephson junctions in high quality thin-film YBaCuO with dimensions below 100 nm fabricated using electron-beam nanolithography. They characterized this Josephson junction technology for process yield, junction parameter uniformity, and overall applicability for use in high-performance circuits. To facilitate the determination of junction parameters, they developed a measurement technique based on spectral analysis in the range of 90–160 GHz of phase-locked, oscillating arrays of up to 2,450 Josephson junctions. Because of the excellent yield and uniformity of the nanobridge junctions, they successfully applied the junction technology to a wide variety of circuits. These circuits included transmission-line pulse formers and 32 and 64-bit shift registers. The 32-bit shift register was shown to operate at clock speeds near 100 GHz and is believed to be one of the faster and more complex digital circuit demonstrated to date using high temperature superconductor technology.

665420 Superfluidity

13923 (ITF–92-32R) **Taking into account dissipative processes in relativistic superfluid systems.** Vil'chinskij, S.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 8p. (In Russian). Order Number DE94617391. Source: OSTI; NTIS (US Sales Only); INIS.

WE introduce the dissipative terms in the equations of relativistic superfluidity theory and show that taking into account dissipation leads to modification of second hydrodynamical theorems. (author). 5 refs.

13924 (ITF–92-47R) **On possible types of vortexes in relativistic superfluid system.** Fomin, P.I.; Vil'chinskij, S.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 9p. (In Russian). Order Number DE94617392. Source: OSTI; NTIS (US Sales Only); INIS.

The superfluid, normal and temperature - type vortexes in relativistic superfluid systems are considered and relation between them are discussed. (author). 6 refs.

13925 (ITF–93-18U) **First, second and fourth sound in relativistic superfluidity theory with account for dissipative effects.** Vyil'chins'kij, S.Yi. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 8p. (In Ukrainian). Order Number DE94617393. Source: OSTI; NTIS (US Sales Only); INIS.

The equations describing the propagation of the first, second and fourth sound in the relativistic theory of superfluidity are derived with account for dissipation. The expressions for the velocity of the first, second and fourth sound are obtained. (author). 4 refs.

665430 Other Topics in Quantum Fluids and Solids

13926 (JINR–3-93-60) **JINR rapid communications: Collection.** Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 76p. (In Russian). Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of observation of the heavy fermion band magnet state in rare-earth alloys $Ce(Ru_{1-x}\ Rh_x)_2B_2$ and $Ce(Cu_{1-x}\ N_x)_2Ge_2$ using inelastic neutron scattering has been discussed.

The idea of new mechanism of induced coherent radiation by the atoms of a gas under the Cherenkov threshold is suggested. The reduced probabilities of delayed fission channels for ^{188}Bi and ^{196}At are determined. 4.5 x A x Gev/C deuteron and carbon nucleus fragmentation into cumulative pions has been measured on various target nuclei. The present states and future development of data acquisition system for the magnetic spectrometer SPHERE are described.

13927 (JINR–3-93-60, pp. 13-25) **Competition of interactions in the Kondo systems and anomalous magnetism of heavy fermions.** Kuzemskij, A.L. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. (In Russian). In *JINR rapid communications: Collection.* 76p. Order Number DE94618212. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of observation of the Heavy Fermion Band Magnet state in rare-earth alloys $Ce(Ru_{1-x}\ Rh_x)_2B_2$ and $Ce(Cu_{1-x}\ N_x)_2Ge_2$ using inelastic neutron scattering has been discussed. Using the rotational invariance of the Periodic Anderson Model and sum rule for the generalised dynamical spin susceptibility the magnetic instability of the Anderson Lattice has been shown. The hydrodynamical pole of the spin susceptibility and neutron cross section have been calculated. The investigation has been performed at the Laboratory of Theoretical Physics. 28 refs., 2 figs.

70 PLASMA PHYSICS AND FUSION

13928 (UCRL-JC–116851) **Spectroscopic measurements of Rosseland mean opacity.** Springer, P.T. (and others); Fields, D.F.; Wilson, B.G. Lawrence Livermore National Lab., CA (United States). Nov 1992. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9211211–5: Radiative properties of hot dense matter conference, Santa Barbara, CA (United States), 2-6 Nov 1992). Order Number DE94008297. Source: OSTI; NTIS; INIS; GPO Dep.

The first quantitative measurement of photoabsorption in the region determining Rosseland and Planck mean opacity, is obtained for an x-ray heated iron plasma, using novel techniques and instrumentation. The plasma density of 0.0113 $\pm$ 0.0013 g/cc and temperature of 59 $\pm$ 3 eV are accurately constrained experimentally by imaging plasma expansion and observing and modeling absorption in sodium dopant ions. The measured iron absorption spectrum is compared with several newly developed opacity models. The data constrains Rosseland and Planck group means with of order 15 percent precision. This is the first quantitative experimental certification of opacity models germane to radiative transfer in LTE plasmas.

7003 Plasma Physics and Fusion Research

Refer also to citation(s) 12949, 13407, 13408, 13409, 14159, 14162, 14164, 14167, 14172, 14174

13929 (BARC–1993/P/004) **Laser and Plasma Technology Division annual report 1992.** Venkatramani, N. (Bhabha Atomic Research Centre, Bombay (India). Laser and Plasma Technology Division); Verma, R.L. (eds.). Bhabha Atomic Research Centre, Bombay (India). 1993. 134p. Order Number DE94617113. Source: OSTI; NTIS (US Sales Only); INIS.

The report describes the research and development (R and D) activities of Laser and Plasma technology Division, Bhabha Atomic Research Centre, Bombay during 1992. The broad programme objectives of the Division are: (1) development and technology readiness studies of laser, plasma and electron beam devices, (2) studies on related physical phenomena with a view to gain better understanding of the devices, and (3) improvements in technology and exploration of new areas. The R and D activities are reported under the sections entitled: (1) Laser Activities, (2) Thermal Plasma Activities, and (3) Electron Beam Activities. At the end of each section, a list of publications by the staff members in the field indicated by the title of the section is given. Some of the highlights of R and D work during 1992 are:(1) fabrication of an electron beam sustained CO_2 laser, (2) commissioning of a 6.5 m high LMMHD (Liquid Metal Magneto-hydrodynamic) generator loaded with 1.5 tons of mercury, (3) fabrication of electron beam processing equipment, and (4) study of the magnetic properties of vanadium nitride films produced by reactive sputtering in an indigenously developed DC magnetron sputtering equipment. (author). 56 figs., 6 tabs.

13930 (BUDKERINP–93-10) **Feasibility study for a novel pulsed neutral beam diagnostics for tokamaks.** Davydenko, V.I.; Ivanov, A.A. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1993. 11p. Order Number DE94617129. Source: OSTI; NTIS (US Sales Only); INIS.

A technical feasibility of the plasma diagnostics scheme using neutral deuterium beam with a pulse length of 0.3 μs, current of 100 A and an energy of as high as 80 keV is described. 13 refs.

13931 (CONF-9309119–4) **Characterization of atomic and molecular impurity sources and transport at the tokamak edge.** Klepper, C.C. (Oak Ridge National Lab., TN (United States)); Hogan, J.T.; Hess, W.R.; Guilhem, D. Oak Ridge National Lab., TN (United States). [1993]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. biennial topical conference on atomic processes in plasmas; San Antonio, TX (United States); 19-23 Sep 1993. Order Number DE94007212. Source: OSTI; NTIS; GPO Dep.

The characterization of impurity sources in the tokamak edge is challenging because of the highly localized nature of impurity generation. Detailed, spatially resolved, diagnostic information is needed, and three-dimensional (3-D) modeling is required for interpretation. There is also a need for a more extensive atomic and molecular data base for the conditions encountered in this region. The availability of new measurements of photon efficiencies for some relevant hydrocarbon molecules for plasma conditions typical for the tokamak edge and the development of a 3-D Monte Carlo impurities code have enabled the successful modeling of spatially resolved measurements in the vicinity of the pump limiter neutralizer plate and near the inner wall of Tore Supra.

13932 (CONF-9309119–5) **Atomic and molecular data needs for fusion.** Schultz, D.R. Oak Ridge National Lab., TN (United States). [1993]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. biennial topical conference on atomic processes in plasmas; San Antonio, TX (United States); 19-23 Sep 1993. Order Number DE94006555. Source: OSTI; NTIS; INIS; GPO Dep.

Atomic and molecular processes in plasmas play a crucial role in the development of net energy producing magnetic fusion devices. In light of this fact, presented here is a survey of the broad needs of fusion energy research and a review of the status of the existing database. Emphasis is placed on the relatively new needs for data as novel materials are evaluated for use in the next devices, and as components such as the divertor take on more significance for demonstration and practical reactors. Also, examples are given of recent or ongoing data evaluation efforts, the role of national and international data centers is discussed, and some summarizing comments are given.

13933 (CTH-ED–241) **Numerical study of the axisymmetric ideal MHD stability of Extrap.** Benda, M. Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics. Apr 1993. 88p. Order Number DE94617187. Source: OSTI; NTIS; INIS.

A numerical study of the free-boundary axisymmetric (n=0) ideal magnetohydrodynamical (MHD) motions of the Extrap device is presented. The dependence of stability on current profiles in the plasma and currents in the external conductors is investigated. Results are shown for linear growth-rates and nonlinear saturation amplitudes and their dependence on plasma radius as well as on the conducting shell radius. A method combined of two different algorithms has been developed and tested. The interior region of the plasma is simulated by means of a Lagrangian Finite Element Method (FEM) for ideal magnetohydrodynamics, The method is based on a nonlinear radiation principle for the Lagrangian description of ideal MHD. The Boundary Element Method (BEM) is used together with the Lagrangian FEM to simulate nonlinear motion of an ideal MHD plasma behaviour in a vacuum region under the influence of external magnetic fields. 31 refs.

13934 (DOE/ET/53088–631) **Transport suppression by shear flow generation in multihelicity resistive-g turbulence.** Sugama, H. (National Inst. for Fusion Science, Nagoya (Japan)); Horton, W. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Nov 1993. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–631). Order Number DE94007108. Source: OSTI; NTIS; INIS; GPO Dep.

Turbulent momentum transport given by the Reynolds stress is considered as one of the candidates explaining the production and sustainment of the mean shear flow in the H-mode plasmas. Here we describe the nature of the shear flow generation and transport reduction in the 3D multihelicity system. The profiles of the Reynolds stress, shear flow and thermal flux in the 3D case are compared with those in the 2D case. The Beklemishev-Horton theory for the anomalous transport which multiplies the 2D transport by the density of distinct mode rational surfaces is found to overestimate the observed flux due to the disappearance of a subset of modes on certain rational surfaces. The mixing-length theory, in which the anomalous transport is independent of the density of mode rational surfaces, underestimates the thermal flux.

13935 (DOE/ET/53088–634) **Anomalous thermalization of fast ions in magnetized plasma.** Chen, K.R. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Nov 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–634). Order Number DE94007109. Source: OSTI; NTIS; INIS; GPO Dep.

A novel anomalous process causing the perpendicular energy of fast ions to be thermalized and lost on average to bulk ion heating, instead of classical slowing down and bulk electron heating, is investigated with PIC simulations. More than half of the fast ions are slowed down to the thermal ion level, although some are heated to twice their birth energy. The fast ion density perturbation is large. This process is excited by a new two-gyro-stream instability and may continually occur in a burning plasma. The implications for fusion ignition and fast ion confinement are assessed.

13936 (DOE/ET/53088–637) **Basic principles approach for studying nonlinear Alfven wave-alpha particle dynamics.** Berk, H.L.; Breizman, B.N.; Pekker, M. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Jan 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–637; CONF-930888–1: Meeting on physics of high-energy particles in toroidal systems, Irvine, CA (United States), 30 Aug - 1 sep 1993). Order Number DE94007112. Source: OSTI; NTIS; INIS; GPO Dep.

An analytical model and a numerical procedure are presented which give a kinetic nonlinear description of the Alfven-wave instabilities driven by the source of energetic particles in a plasma. The steady-state and bursting nonlinear scenarios predicted by the analytical theory are verified in the test numerical simulation of the bump-on-tail instability. A mathematical similarity between the bump-on-tail problem for plasma waves and the Alfven wave problem gives a guideline for the interpretation of the bursts in the wave energy and fast particle losses observed in the tokamak experiments with neutral beam injection.

13937 (DOE/ET/53088–639) **L-H confinement mode dynamics in three-dimensional state space.** Sugama, H. (National Inst. for Fusion Science, Nagoya (Japan)); Horton, W. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Jan 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–639). Order Number DE94007113. Source: OSTI; NTIS; INIS; GPO Dep.

The dynamical model for the L-H confinement mode transitions consisting of three ordinary differential equations (3-ODE model) for the essential state variables is proposed. The model is derived from the energy balance equations for the resistive pressure-gradient-driven turbulence and describes temporal evolutions of three characteristic variables (u.k.f) the potential energy contained in the pressure gradient, the turbulent kinetic energy and the shear flow energy. The energy input to the peripheral plasma region is included as an external control parameter in the model. The model equations have stationary solutions corresponding to the L and H modes. The authors obtain the L to H and H to L transition with the energy input parameter changed. The type of the L-H transition, whether a first-order or second-order transition, is shown to be determined by the shear flow damping coefficient. They also find the parameter region in which the H mode stationary solution becomes unstable and bifurcates to the limit cycle which shows periodic oscillations characteristic of the ELM confinement state.

13938 (DOE/FTR–94004455) **Travel to Italy to attend the 4th international workshop on plasma edge theory in fusion devices: Foreign trip report, September 30, 1993–October 6, 1993.** Krasheninnikov, S.; Sigmar, D.J. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. 15 Dec 1993. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER54109. Order Number DE94004455. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The travelers attended this international workshop (a.k.a. PET IV) organized through the Max-Planck Institut for Plasmaphysik, Garching, Germany. D.J. Sigmar was co-author of one work of S. Krasheninnikov (MIT), O. Batischev and Y. Sigov (both from Keldysh Institute, Moscow) on analytic theory and numerical modelling of the divertor plasma. An invited oral presentation on the present state of kinetics of tokamak edge plasma was given by Krasheninnikov.

13939 (ENEA-RT-ERG-FUS–93-02) **Resistive damping of toroidicity induced Alfven eigenmode.** Kar, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Vlad, G.; Romanelli, F. No corporate text available. 1993. 10p. (RT/ERG-FUS–93-02). Order Number DE94752536. Source: OSTI; NTIS (US Sales Only).

The MHD equations were used to study the resistive damping of the toroidicity induced Alfven eigenmode by employing the ballooning formalism. In the parameter regime in which the normalized plasma resistivity (n) is much less than the inverse aspect ratio (e), the equations are solved, by employing asymptotic techniques to yield a damping rate scaling gamma n/e^2. For $n >> e^3$, the damping rate is independent of e and scales as gamma $n^{1/3}$. The analytical results were verified numerically using a toroidal resistive MHD stability code.

13940 (ETDE-IT–94-14) **Progress in understanding of ion temperature gradient driven transport.** Romanelli, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). No corporate text available. 1993. 14p. (CONF-9301107–2: U.S./Japan workshop on ion temperature gradient driven turbulent transport, Austin, TX (United States), 11-14 Jan 1993). Order Number DE94752515. Source: OSTI; NTIS (US Sales Only).

An analysis of the radial structure of the ion temperature gradient driven mode is presented and the dependence of the radial correlation length (L_r) on parameters such as magnetic shear is discussed. It is found that L_r decreases algebraically with increasing shear for moderate shear values, and it, decreases exponentially with decreasing shear for low shear values. These results seem in qualitative agreement with several experiments which evidence a strong reduction of the transport coefficients close to the magnetic axis.

13941 (ETDE-IT–94-17) **Kinetic stability of internal kink mode.** Romanelli, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Fogaccia, G. No corporate text available. 1993. 12p. Order Number DE94752519. Source: OSTI; NTIS (US Sales Only).

With reference to studies of the attainment of ignited operations on devices like ITER (International Thermonuclear Experimental Reactor), the stability of the internal kink mode is re-investigated by taking into account the contribution of perpendicular compressibility, obtained by solving the drift kinetic equation. The resulting stability condition yields threshold values typically larger than the conventional Bussac criterion. For the case of ultra-flat safety factor profiles, the mode can be stable also in the absence of line-bending.

13942 (ETDE-IT–94-19) **Study of deuterium charging in palladium by electrolysis of heavy water.** De Ninno, A. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Violante, V. No corporate text available. 1992. 14p. Order Number DE94752521. Source: OSTI; NTIS (US Sales Only).

A mathematical model supported by a numerical computer code with distributed parameters was developed in order to describe the evolution of the deuteron concentration profile inside a Pd cathode under pulsed electrolysis. A delocalized gas picture was used when the deuterons exceeded the ratio, x=0.8, in Pd-D compounds. Several boundary conditions were taken into account. A good agreement was found between the system evolution and experimental data.

13943 (ETDE-IT–94-23) **Gamma diagnostics of thermonuclear plasma using D(d, gamma)^{4}He reaction: Feasibility study.** Robouch, B.V. (Stevens Inst. of Tech., Hoboken, NJ (United States). Dept. of Physics and Engineering Physics); Brzosko, J.S.; Fubini, A.; Haegi, M.; Ingrosso, L. No corporate text available. 1993. 10p. (CONF-9305231–3: International Atomic Energy Agency (IAEA) technical committee meeting, Trieste (Italy), 10-14 May 1993). Order Number DE94752542. Source: OSTI; NTIS (US Sales Only).

Recent measurements of the D(d, Y)^{4}He (Ey=25 MeV) reaction cross-section at low energies indicate values about 3 orders of magnitude higher than those obtained through extrapolations of previous experimental data. The new information triggers interest in the use of 25 MeV photons for diagnostics of fusion plasma. Both the spectral broadening of the neutron emission from the D(d, n)-reaction and that of the of the 25 MeV Gamma line offer two sensitive methods for the measurement of plasma temperature. Implementing this method presents an advantage over the classical neutron spectra broadening ((d, n)-branch) since it is simpler, more compact and cheaper. Moreover, once the necessary enhancement of the Y/n ratio is ensured, other complementary Y-diagnostics (under intense neutron fluxes) become possible. A preliminary version of such a system was developed using the 3D-MCSC-RWR subroutine complex of Monte Carlo random walk. The detecting system, composed of a HPGe-detector surrounded by a multilayer shield, appears to be very promising.

13944 (ETDE-IT–94-28) **Radial structure of ion temperature gradient driven mode.** Romanelli, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Zonca, F. No corporate text available. 1993. 29p. Order Number DE94752549. Source: OSTI; NTIS (US Sales Only).

An analysis of the radial structure of the ion temperature gradient driven mode is presented and the dependence of the radial correlation length (L_r) on parameters such as magnetic shear is discussed. It is found that L decreases algebraically with increasing shear for moderate to large shear values and it decreases exponentially with decreasing shear for low shear values. These results seem in qualitative agreement with several experiments which evidence a strong reduction of the transport coefficients close to the magnetic axis.

13945 (EUR-CEA-FC–1475) **On the dynamics of the power spectrum during lower hybrid current drive in Tokamaks.** Bizarro, J.P. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. Jan 1993. 14p. Grant B 89000563. Source: OSTI; NTIS (US Sales Only); INIS.

An investigation is provided on the propagation and absorption of the power spectrum during lower hybrid current drive in Tokamaks. A combined ray tracing and Fokker-Planck code is utilized and stochastic effects induced by toroidicity are correctly taken into account by using a large number of rays. It is shown that when strong wave damping prevails the absorbed spectrum is very similar in shape to the launched one, although some broadening and shifting in parallel wave index generally occur, and power deposition is localized. If the wave damping is weak and stochastic effects are important, rays end up sweeping the entire plasma cross-section, power deposition turns out to be extended, and the absorbed spectrum is much broader than the launched one.

13946 (EUR-CEA-FC–1482) **Non diffusive corrections to the long scale behavior of ensembles of turbulent magnetic field lines. Application of the functional method.** Misguich, J.H. (Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Spineanu, F.; Vlad, M. Association Euratom-CEA, Centre d'Etudes de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee. Feb 1993. 40p. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of the transversal spreading of the magnetic field lines in a turbulent plasma is investigated analytically in order to obtain a statistical characterization at large spatial scales. We develop a functional integral method which allows to calculate in a systematic way statistical averages of physical quantities which depend on the fluctuating field. The known magnetic diffusion coefficient for the shearless case is corrected with a term which arises from the assumption of a finite transversal correlation length. For the case with magnetic shear the functional method provides the appropriate frame for a perturbative approach based on series of diagrams.

13947 (FEI–2227) **Measuring neutrons and tritium yield in cold fusion reactions.** Grigor'ev, Yu.V.; Lisichkin, Yu.V.; Novikov, A.G.; Prokhorov, S.S.; Shcherbinin, P.P.; Yadrovskij, E.L. Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk (Russian Federation). Fiziko-Ehnergeticheskij Inst. 1991. 6p. (In Russian). Order Number DE94617229. Source: OSTI; NTIS (US Sales Only); INIS.

The researches on the detection of the cold fusion products have been conducting the direct and altering current through the 0.1M KOD + 0.9M D_2O electrolyte, using the palladium, platinum and titanium electrodes. For the neutron registering the battery has been used of ten He-3 counters of the type SNM-18 of the 4π-geometry with the efficiency to the thermal neutrons equal to 6% and with the proper background of 0.1 p/s. The tritium was registered using the scintillation installation RGS-05 and the mass spectrometer, the electrodes and the electrolyte having been analysed on the tritium content before and after the experiment. During the measurements the neutron yield was not observed, but the detection has been made of the tritium and another substance, having the mass of a.u.m., and the quantity of which surpassed the natural content. 2 refs., 1 fig.

13948 (GA-A–21518) **FWCD and ECCD experiments on DIII-D.** Prater, R. (General Atomics, San Diego, CA (United States)); Austin, M.E.; Baity, F.W. General Atomics, San Diego, CA (United States); Oak Ridge National Lab., TN (United States); Lawrence Livermore National Lab., CA (United States). Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400 ; W-7405-ENG-48. (CONF-9311140–2: IAEA meeting on radio-frequency launchers for plasma heating and current drive, Naka (Japan), 10-12 Nov 1993). Order Number DE94007371. Source: OSTI; NTIS; INIS; GPO Dep.

Fast wave current drive and electron cyclotron current drive experiments have been performed on the DIII-D tokamak as part of the advanced tokamak program. The goal of this program is to develop techniques for controlling the profile of the current density in order to access regimes of improved confinement and stability. The experiments on fast wave current drive used a four strap antenna with 900 phasing between straps. A decoupler was used to help maintain the phasing, and feedback control of the plasma position was used to keep the resistive loading constant. RF pickup loops demonstrate that the directivity of the antenna is as expected. Plasma currents up to 0.18 MA were driven by 1.5 MW of fast wave power. Electron cyclotron current drive experiments at 60 GHz have shown 0.1 MA of plasma current driven by 1 MW of power. New fast wave and electron cyclotron heating systems are in development for DIII-D, so that the goals of the advanced tokamak program can be carried out.

13949 (GA-A–21520) **Overview of H-mode studies in DIII-D.** Groebner, R.J. (General Atomics, San Diego, CA (United States)); Baker, D.R.; Allen, S.L. General Atomics, San Diego, CA (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; FG03-89ER51121 ; FG03-86ER53225 ; AC05-84OR21400 ; AC04-76DP00789. (CONF-9311147–4: IAEA meeting on H-mode physics, Naka (Japan), 15-17 Nov 1993). Order Number DE94007430. Source: OSTI; NTIS; INIS; GPO Dep.

A major portion of the DIII-D program includes studies of the L-H transition, of the VH-mode, of particle transport and control and of the power-handling capability of a diverter. Significant progress has been made in all of these areas and the purpose of this paper is to

summarize the major results obtained during the last two years. An increased understanding of the origin of improved confinement in H-mode and in VH-mode discharges has been obtained, good impurity control has been achieved in several operating scenarios, studies of helium transport provide encouraging results from the point of view of reactor design, an actively pumped diverter chamber has controlled the density in H-mode discharges and a radiative diverter is a promising technique for controlling the heat flux from the main plasma.

13950 (GA-A–21525) **Noninductive current drive experiments on DIII-D, and future plans.** Prater, R. (General Atomics, San Diego, CA (United States)); Austin, M.E.; Baity, F.W. General Atomics, San Diego, CA (United States). Feb 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; AC05-84OR21400 ; W-7405-ENG-48. (CONF-931178–1: 5. international Toki conference on plasma physics and controlled nuclear fusion: physics and technology of plasma heating and current drive, Toki (Japan), 16-19 Nov 1993). Order Number DE94007373. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments on DIII-D (and other tokamaks) have shown that improved performance can follow from optimization of the current density profile. Increased confinement of energy and a higher limit on beta have both been found in discharges in which the current density profile is modified through transient means, such as ramping of current or elongation. Peaking of the current distribution to obtain discharges with high internal inductance ℓ_i has been found to be beneficial. Alternatively, discharges with broader profiles, as in the VH-mode or with high beta poloidal, have shown improved performance. Noninductive current drive is a means to access these modes of improved confinement on a steady state basis. Accordingly, experiments on noninductive current drive are underway on the DIII-D tokamak using fast waves, electron cyclotron waves. Recent experiments on fast wave current drive have demonstrated the ability to drive up to 180 kA of noninductive current using 1.5 MW of power at 60 MHz, including the contribution from 1 MW of ECCD and the bootstrap current. Higher power rf current drive systems are needed to strongly affect the current profile on DIII-D. An upgrade to the FWCD system is underway to increase the total power to 6 MW, using two additional antennas and two new 30 to 120 MHz transmitters. Additionally, a 1 MW prototype ECH system at 110 GHz is being developed (with eventual upgrade to 10 MW). With these systems, noninductive current drive at the 1 MA level will be available for experiments on profile control in DIII-D.

13951 (GA-A–21541) **Experimental survey of the L-H transition conditions in the DIII-D tokamak.** Carlstrom, T.N. (General Atomics, San Diego, CA (United States)); Gohil, P.; Watkins, J.C. General Atomics, San Diego, CA (United States); Sandia National Labs., Albuquerque, NM (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States); California Univ., Los Angeles, CA (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; FG03-89ER51121 ; AC02-78ET51013 ; AC04-76DP00789. (CONF-9311147–6: IAEA meeting on H-mode physics, Naka (Japan), 15-17 Nov 1993). Order Number DE94007428. Source: OSTI; NTIS; INIS; GPO Dep.

We present the global analysis of a recent survey of the H-mode power threshold in DIII-D using $D^0 \rightarrow D^+$ NBI after boronization of the vacuum vessel. Single parameter scans of B_T, I_p, density, and plasma shape have been carried out on the DIII-D tokamak for neutral beam heated single-null and double-null diverted plasmas. In single-null discharges, the power threshold is found to increase approximately linearly with B_T and n_e but remains independent of I_p. In double-null discharges, the power threshold is found to be approximately independent of both B_T and n_e. Various shape parameters such as plasma-wall gaps had only a weak effect on the power threshold. Imbalancing the double null configuration resulted in a large increase in the threshold power.

13952 (GA-A–21554) **Recent VH-mode results on DIII-D.** Osborne, T.H. (General Atomics, San Diego, CA (United States)); Burrell, K.H.; Carlstrom, T.N. General Atomics, San Diego, CA (United States); California Univ., Los Angeles, CA (United States); Lawrence Livermore National Lab., CA (United States); Oak Ridge National Lab., TN (United States). Jan 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114 ; FG03-86ER53225 ; W-7405-ENG-48 ; AC05-84OR21400. (CONF-9311147–5: IAEA meeting on H-mode physics, Naka (Japan), 15-17 Nov 1993). Order Number DE94007429. Source: OSTI; NTIS; INIS; GPO Dep.

A regime of improved H-mode energy confinement, VH-mode, is obtained in the DIII-D tokamak with adequate vessel conditioning. The improved confinement in VH-mode is consistent with the extension of the region of high $E \times B$ velocity shear turbulence suppression zone further in from the plasma boundary. The energy confinement enhancement in VH-mode can be limited by ELMs, localized momentum transfer events, or operation at high heating power or low q. Energy confinement enhancement improves with increasing triangularity of the plasma cross section and is independent of elongation. The termination of VH-mode is associated with an edge localized kink mode which is destabilized by both the large edge pressure gradient and edge current density.

13953 (INIS-BR–3254) **Magnetic surfaces of toroidal helical fields in tokamaks.** Monteiro, L.H.A. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. Oct 1990. 136p. (In Portuguese). Order Number DE94618761. Source: OSTI; NTIS (US Sales Only); INIS.

It is proposed to analyse theoretically the disruptive instability that occurs in confined plasmas in tokamaks, through investigation of the influence of resonant helical fields on their equilibrium; With this aim, a superposition of the magnetic field of the plasma in static MHD equilibrium with the field associated with the resonances is considered, taking into account the toroidal geometry of the tokamak. Due to the lack of symmetry, the lines of the total magnetic field resulting from this superposition must form magnetic surfaces only around some regions of the plasma. using the averaging method, functions of approximate magnetic surfaces are obtained (analytically) around the regions of resonances of the plasma (they contain the lines of this total magnetic field). It was verified that these approximate surfaces have structures of magnetic islands. (author).

13954 (INIS-JP–017) **Towards nuclear fusion reactors: Present status of nuclear fusion research and development in JAERI, 1993.** Japan Atomic Energy Research Inst., Tokyo (Japan). Nov 1993. 115p. (In Japanese). Order Number DE94748680. Source: OSTI; NTIS; INIS.

The results of nuclear fusion researches in JAERI are summarized. In this report, following themes are collected: the concept of fusion reactor (including ITER), fusion reactor safety, plasma confinement, fusion reactor equipment, and so on. Includes glossary. (J.P.N.).

13955 (INIS-mf–13749, pp. 115) **Electron density measurement in tokamaks using lasers.** Avakian, M. (Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Nuclear Research Centre); Ghorannevis, M. Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications*. Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. TOKAMAK DEVICES/electron density; TOKAMAK DEVICES/laser radiation; ELECTROMAGNETIC RADIATION; PLASMA DENSITY; REFRACTION; WAVELENGTHS

13956 (INIS-mf–13760) **IAEA technical committee meeting on pellet injection.** International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The IAEA Technical Committee Meeting on Pellet Injection, May 10-12, 1993, at the Japan Atomic Energy Research Institute, Naka, Ibaraki-ken, Japan, was held to review the latest results on pellet injection and its effects on plasma confinement. In particular, topics included in the meeting include (i) pellet ablation and particle fueling results, (ii) pellet injection effects on confinement, including improved confinement modes, edge effects, magnetohydrodynamic

activity and impurity transport, and (iii) injector technology and diagnostics using pellets. About 30 experts attended and 23 papers were presented. Refs, figs and tabs.

13957 (INIS-mf–13760, pp. 11-32) **TFTR deuterium pellet injection experiments.** Schmidt, G.L. (Oak Ridge National Lab., TN (United States)); Baylor, L.; Hulse, R. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

TFTR experiments using deuterium pellets with size 3.4 to 4 mm are summarized. Pellet injection was used here to study charged-particle transport and energy confinement. Particle transport following pellet density perturbations has been investigated using both non-linear transport models and purely empirical fits to simple forms of the transport coefficients. Energy confinement in super-shots and pellet peaked density profile discharges has been investigated. In super-shot plasmas, pellets have been used to modify an existing plasma condition to explore the relationship of the ion-temperature-gradient-driven drift mode parameter to energy transport. In pellet peaked density profile discharges, plasma conditions for improved core confinement were established, complementing earlier results for the JET tokamak. 20 figs.

13958 (INIS-mf–13760, pp. 39-44) **Pellet injection study in JT-60U.** Yoshino, R. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Dept. of Large Tokamak Research). JT-60 Team. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Preliminary experimental results of pellet injection in JT-60U are presented in this paper. (1) Particle fuelling by the pellet injection modified the NB heating profile and changed the resultant pressure profile. This modification avoided β_p-collapse and produced H-mode transition in high β_p experiments. (2) Combination of the monster sawteeth produced by 2.5MW ICRF central heating and the central particle fuelling by the pellet injection improved the energy confinement a little. (3) Pellet injection with the following NB heating suppressed the locked mode. (4) A central white ring or a hollow white ring observed in a plasma just after the pellet injection was measured by a tangential visible TV, and agreed well with the location of the particle fuellings. 11 refs, 11 figs.

13959 (INIS-mf–13760, pp. 77-82) **Influence of pellet injection of plasma peaking and mode excitation in TEXTOR.** Finken, K.H. (Association Euratom-Kernforschungsanlage Juelich (Germany). Inst. fuer Plasmaphysik); Fuchs, G.; Graffman, E. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Profile peaking after pellet injection and pellet injection into runaway discharges are briefly discussed. 4 refs, 4 figs.

13960 (INIS-mf–13760, pp. 83-87) **Pellet injection related research at RTP.** Oomens, A.A.M. (Association Euratom-FOM, Nieuwegein (Netherlands). FOM-Inst. voor Plasmafysica 'Rijnhuizen'); Cruz, D.F. da; Gelder, J.F.M. van; Lok, J.; Rommers, J.H. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The pellet injection system for the RTP tokamak and preliminary results obtained with it are briefly discussed. Future plans are outlined as well. 5 refs, 4 figs.

13961 (INIS-mf–13760, pp. 99-104) **Snake-like density oscillations by pellet injection and its relation with sawtooth activities in the TEXTOR plasmas.** Sato, K.N. (National Inst. for Fusion Science, Nagoya (Japan)); Akiyama, H.; Kogoshi, S. KFA TEXTOR Team. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Excitation of fast and large density oscillations has been observed in the core region of pellet-injected TEXTOR plasmas. The phenomena seem to be similar to those observed in Alcator C and JET, and JT-60, although there exist several differences. Typical results of electron line densities are obtained by 9-channel FIR interferometry. The fast oscillation of large perturbation is clearly seen in the core region just after the pellet injection. The oscillation seems more likely to occur when a pellet is injected more deeply into the plasma. The frequency is typically around 0.7-2 kHz and the oscillation usually terminates after about ten msec. In some cases, however, it appears not only immediately after the injection (which we call the first oscillation), but also some tens of milliseconds after it, which we call the second oscillation. Sometimes, the first and the second ones seem to interact with each other, possibly depending on the timing or phase of pellet injection with respect to the sawtooth activity before the injection. These second oscillations are unique features in the TEXTOR plasma, which have not been observed on other experiments. Here, the characteristics of the first and second oscillations as a function of penetration depth are briefly discussed, as well as the Faraday rotation measurements of pellet-injected plasma and the location of "snake-like" density oscillations. 6 refs, 5 figs.

13962 (INIS-mf–13760, pp. 105-114) **Strong magnetic fluctuations due to an ablating pellet, and fueled particle response to the SOL and divertor.** Zushi, H. (Kyoto Univ., Uji (Japan). Plasma Physics Lab.); Mizuuchi, T.; Nagasaki, K.; Kurimoto, Y.; Furukawa, T.; Suzuki, Y.; Wakatani, M.; Sudo, S. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Results of pellet injection experiments on propagation of cold dense plasmoids, related fluctuations, and its application to estimation of the effective connection length are presented. A sharp pulse-like density response is observed at the initial phase of density rise for edge fueling case. Characteristic propagation velocity is evaluated by a measured delay time and the length of a line from calculations of the field line tracing. During this phase bursts of magnetic ($\tilde{B}_\theta$) and density (with $\kappa_{\perp} \tilde{B}_\phi$) fluctuations are observed and may be caused by a rapid equilibrium process of ablated plasmoid along the magnetic file line. Mode analysis results and good correlation with H_α fluctuations are discussed from a point of view of resonant interaction between pellet ablation and rational surfaces. By measuring the delayed response of the ion saturation current at the divertor due to pellet fueling, it might be possible to estimate the effective connection length from the edge to the divertor and to evaluate the ergodicity of the magnetic surfaces near the edge. The effects of global confinement properties on parallel transport are discussed. (author). 12 refs, 11 figs.

13963 (INIS-mf–13760, pp. 115-120) **MHD activities in pellet injected discharges in JT-60 and JT-60U.** Kamada, Y. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Yoshino, R.; Ozeki, T.; Azumi, M.; Nagami, M. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

This paper treats some topics related to MHD activities modified by pellet injection in JT-60 and JT-60U, which also reports that the

rational surfaces and islands behave as a barrier for particle transport. In JT-60 and JT-60U, discharges with deep pellet penetration are characterized by peaked density and pressure profiles just inside the q=1 surface. With deepening pellet penetration, the sawtooth frequency becomes longer and the sawtooth crash changes its characteristics from full collapse to partial collapse and finally behaves as a non-reconnecting collapse. Shallow pellet penetration can trigger an m/n=2/1 mode which behaves like the snake oscillation; the particle confinement inside the 2/1 island is much longer than the back ground particle confinement. 16 refs, 5 figs.

13964 (INIS-mf–13760, pp. 121-145) **Fuelling of JET H-mode and limiter plasmas by deuterium pellet injection.** Schmidt, G.L. (Princeton Univ., NJ (United States)); Bartlett, D.; Baylor, L. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

This paper describes JET multi-pellet fuelling experiments using a range of pellet perturbations in L-mode (limiter) and H-mode (x-point) plasma configurations heated primarily by ICRH. A retained mass fraction or fuelling efficiency of 0.4 to 0.5 is typical of pellet fuelled discharges using auxiliary heating and shallow pellet penetration during the fuelling sequence. The radial distribution of the retained pellet mass, the effective pellet particle source, is shifted outward in minor radius when compared to that predicted by the standard ablation models. Small and moderate pellet perturbations, $N_{pel}/<n_e>$ less than or ≈ 1, with shallow penetration produce density profiles which remain broad. If the profile is represented by the expression $n_e(r)=n_e(0)\ (1-(r/a)^2)^\alpha$, then $\alpha \leq 0.5$. Sawtooth oscillations persist in these discharges and can transport deposited pellet mass to the plasma core particularly in cases of strong density profile inversion immediately following the pellet event. Perturbations of this magnitude can be used in limiter and H-mode discharges near the density limit. In H-mode discharges under these conditions the pellet event can coincide with a transition to a period of L-mode confinement. 2 refs, 18 figs.

13965 (INIS-mf–13779) **Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.** International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

This document consists of a collection of papers presented at the IAEA Technical Committee Meeting on Research Using Small Tokamaks. It contains 22 papers on a wide variety of research aspects, including diagnostics, design, transport, equilibrium, stability, and confinement. Some of these papers are devoted to other concepts (stellarators, compact tori). Refs, figs and tabs.

13966 (INIS-mf–13779, pp. 1-6) **Combined electron cyclotron and lower hybrid current drive on WT-3 tokamak.** Maekawa, T. (Kyoto Univ. (Japan). Dept. of Physics); Maehara, T.; Nakamura, K. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The plasma current is ramped up by oblique injection of the electron cyclotron (EC) wave in the form of X-mode into a lower hybrid current drive (LHCD) plasma in the WT-3 tokamak (major radius R_0=0.65 m, minor radius a=0.2 m and toroidal field Br (0)$\leq$1.75 T). The current ramp-up is due to selective EC heating of tail electrons by the fundamental EC resonance at an upshift frequency due to the Doppler effect. Nearly the same current ramp-up rate is obtained for the same additional power injected by stepping up the LH power instead of EC power, while increment hard X-ray emission is larger in the EC case. This results suggests that the current is carried away by more energetic electrons in the EC case compared with the LH case. (author). 7 refs, 4 figs.

13967 (INIS-mf–13779, pp. 17-20) **Disruption control experiments using external resonant magnetic perturbations in the SINP tokamak.** Sekar Iyengar, A.N. (Saha Inst. of Nuclear Physics, Calcutta (India)); Pal, R.; Majumdar, S.K. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

This is a very brief account of experiments on the SINP tokamak involving the application of external resonant magnetic field perturbations for the suppression or minimization of loop voltage spikes. Magnetic probe measurements show an extended locked mode type of activity, while powering the coils in very-low-q(a) discharges reduces the low-frequency components but increases the high-frequency components. 1 ref., 2 figs.

13968 (INIS-mf–13779, pp. 21-26) **Phaedrus-T results on impurity and density control with rf an on diagnostic development.** Breun, R. (Wisconsin Univ., Madison, WI (United States)); Brouchous, D.; Diebold, D. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Rf studies in small to medium sized tokamaks requires strict attention to impurity control along with innovative antenna design. A combination of bakeable insulated antenna surrounds, graphite limiters, boroniztion, and frequent He-glow discharge cleaning has resulted in reasonable impurity levels and control of rf induced density increases. Phaedrus-T's relatively small size has allowed us to test innovative antenna designs. We found that an insulator-limiter scheme is a viable antenna construction technique. Boronization techniques have mostly involved gas phase boronization using TMB ($(CH_3)_3B$) although lately we have added solid state boronization using a boron-carbide rod with good results. Besides our main focus on rf issues, Phaedrus-T continues to be used as a test bed for various diagnostic techniques because of its size and accessibility. A comparison between BES (Beam Emission Spectroscopy) and probe measured fluctuations was carried out to add credence to the larger BES efforts on TFTR. Measurements of Phaedrus-T fluctuation characteristics were also made during a collaboration with the University of Texas portable probe diagnostic group. A narrow band and high throughput XUV imaging camera using layer synthetic microstructure coated optics developed by Johns Hopkins University is being tested. A Russian built Gaseous Electro-Luminescent Proportional Detector for measuring soft X-ray spectrum in the 1-10 KeV range with a spectral FWHM resolution of 8% at 6 KeV is under test. (author). 12 refs, 3 figs.

13969 (INIS-mf–13779, pp. 27-52) **Improved confinement studies in TUMAN-3 tokamak.** Golant, V.E. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Levedev, S.V. TUMAN-3 Team. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Unusual methods of H-mode initiation were observed in the small tokamak TUMAN-3 in circular limiter configuration. Transitions from ordinary ohmic confinement into the H-mode were caused by means of (1) short increase of puffing rate, (2) minor radius magnetic compression, (3) biasing of the plasma boundary and (4) LiD pellet injection. In some cases transition into the improved confinement regimes arises spontaneously without any external disturbances. H-mode in TUMAN-3has typical signatures of the auxiliary heated divertor H-mode in bigger devices: reduction of the transport near the boundary, suppression of the fluctuations in this region, increase of the stored energy and of the number of particles in the plasma, drop of D_α radiation. Some peculiarities of

the Ohmic H-mode were found: (1) noticeable improvement in the core confinement; (2) transient drop in the boundary electron temperature; (3) possibility to trigger H-mode by perturbation of the density gradient. (author). 22 refs, 11 figs, 1 tab.

13970 (INIS-mf–13779, pp. 53-58) **Regimes with improved particle confinement on CASTOR tokamak.** Badalec, J. (Ceskoslovenska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Stoeckel, J.; Kryska, L.; Zacek, F. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. Grant CSAS 14310; CSAS 14356; Contract IAEA-R-6702/RB. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

An increase of line average electron density was observed in several experiments in CASTOR tokamak, namely in the lower hybrid current drive (LHCD) discharges and in a limiter biasing (BL) experiments. Such behaviour of the density can be attributed to an improvement of particle confinement. A simple code is used to estimate the particle confinement time τ_p and a weight coefficient is introduced to evaluate an effect of the recycling at the limiter, which is a significant source of particles. (author). 7 refs, 4 figs.

13971 (INIS-mf–13779, pp. 74-78) **Relation between periphery phenomena of the plasma and perturbed poloidal magnetic field during the L-H transition on HL-1 tokamak.** Wang, Z. (Southwestern Inst. of Physics, Chengdu, Sichuan (China)); Ran, L.; Zheng, Y.; Li, K.; Deng, Z.; Luo, C.; Yang, S.; Huang, K.; Xiong, T.; Liu, Z. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The experiments on H mode discharge induced by biasing electrode near the plasma edge has been performed on the HL-1 tokamak. The experimental results show that the edge parameters of the plasma change significantly during the L-H transition. The D α radiation from the plasma edge dropped very rapidly during biasing. At the same time the energy of the plasma and energy confinement time obtained from diamagnetic measurements increased. A decrease in electrostatic fluctuations near the plasma edge occurred and the saturation ion current measured with a Langmuir probe reduced to a very low level. The poloidal magnetic field perturbation decreased, which indicated the global plasma MHD activities were suppressed strongly during the L-H transition. The amplitude of the poloidal magnetic field perturbation dropped down by 85%-95%. But the frequency at the peak of the power spectrum of fluctuations increased by almost a factor two. This result is different from that obtained in other tokamak L-H transition experiment. 2 refs, 4 figs.

13972 (INIS-mf–13779, pp. 79-85) **Resistance anomaly in very-low-q plasma.** Takeji, S. (Tokyo Univ. (Japan). Faculty of Engineering); Uchikado, J.; Kido, S.; Ogawa, Y.; Yoshida, Z.; Morikawa, J.; Nihei, H.; Inoue, N. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Basic studies of very-low-q ($1 < q_a < 2$) discharges have been done on REPUTE-1Q device. In the very-low-q discharges relatively high electron temperature was observed (by soft x-ray pulse height analysis) and it was confirmed that the resistance has appreciable anomaly. The relatively high electron temperature may be due to anomalous heating of electrons by the excess power through the resistance anomaly. (author). 10 refs, 6 figs.

13973 (INIS-mf–13779, pp. 86-91) **Micro-pellet injection by blow-off method into MT-1M tokamak plasmas.** Zoletnik, S. (KFKI Research Inst. for Particle and Nuclear Physics, Budapest (Hungary)); Bakos, J.S.; Ignacz, P.N.; Kardon, B.; Kalvin, S.; Kocsis, G.; Szigeti, J.; Veres, G. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Spatially and temporally localized enhanced emission was detected in the radiation of the MT-1M tokamak plasma following the injection of high fluence sodium beam and glass micropellets. In the case of sodium injection this effect was observed not only at the toroidal cross-section of the beam, but also at 60 deg. C displaced from it. The presence of an ion packet travelling along magnetic field lines for long distances may give some qualitative explanation to the experimental findings. (author). 8 refs, 5 figs.

13974 (INIS-mf–13779, pp. 99-108) **Hard X-ray intensity reduction during lower hybrid current drive experiments.** Mlynar, J. (Charles Univ., Prague (Czech Republic). Faculty of Mathematics and Physics); Stoeckel, J.; Magula, P. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. Grant CSAS 14310; Contract IAEA-R-6702/RB. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

A strong reduction of monitored hard X-ray intensity is observed during lower hybrid current drive (LHCD) at the Castor tokamak. We interpret it as an improvement of the runaway electron confinement. This supposition is reinforced by observation of a decreased of magnetic fluctuations level during LHCD phase of the discharge. (author). 6 refs, 6 figs.

13975 (INIS-mf–13779, pp. 109-118) **Correlation and dimensional analysis of density fluctuations on CASTOR tokamak.** Stoeckel, J. (Ceskoslovenska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Kryska, L.; Holakovsky, J.; Petrzilka, J.; Svoboda, V.; Zacek, F. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. Grant CSAS 14310; Contract IAEA-R-6702/RB. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Regimes with reduced level of edge fluctuations are investigated on the CASTOR tokamak: Lower Hybrid Current Drive (LHCD) regime; Edge Plasma Polarization (EP) regime. The radial electric field is produced by means of a biased electrode immersed into the edge plasma. The particle confinement improves only for LHCD, in spite of the fact that the density fluctuations are reduced in both cases. This suggests that the role of edge fluctuations in the global confinement is more complex then it is generally assumed. At the same time, the correlation and dimensional analysis of fluctuation data indicates significant changes in character of the density fluctuations. Namely: 1) The autocorrelation time in the rest (convected) frame increases and 2) the fluctuations are more stochastic (closer to the white noise) when the particle confinement improves. (author). 7 figs.

13976 (INIS-mf–13779, pp. 119-137) **Fast lithium-beam spectroscopy of tokamak edge plasmas.** Wolfrum, E. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik); Aumayr, F.; Wutte, D.; Winter, H.P.; Hintz, E.; Rusbueldt, D.; Schorn, R.P. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Plasma-wall interaction- and impurity transport processes in the outermost region of magnetically confined hot plasmas (the so-called plasma edge) must be well understood for successful development of future thermonuclear fusion reactors. To this goal,

sufficiently detailed edge plasma diagnostics are in great demand. By injecting a fast Li beam into the edge plasma region, a great number of informations can be obtained with excellent space- and time resolution. This so-called Li-beam plasma spectroscopy gives access not only to edge plasma density profiles from the collisionally excited Li atoms, but also to the impurity concentration- and temperature profiles via line emission induced by electron capture from the injected Li atoms by the impurity ions. Full utilization of all capabilities requires a reliable data base for the atomic collision processes involving injected Li atoms and plasma constituents (i.e. electrons, hydrogen ions and relevant impurities in their various charge states), since a precise modelling of Li beam attenuation and excited-state composition has to be made for evaluating desired plasma properties from the related spectroscopical measurements. The most recent methodical improvement permits a fully consistent determination of absolute edge plasma density profiles by measuring only relative LiI line emission profiles. This is of special interest for investigating rapid edge plasma density fluctuations in connection with e.g. ELMs, L-H mode transition, turbulence or edge cooling by impurity injection. This paper describes the capabilities of Li-beam edge plasma spectroscopy by way of illustrative examples from measurements at the tokamak experiment TEXTOR. (author). 41 refs, 5 figs.

13977 (INIS-mf–13779, pp. 138-145) **Diagnostic arc source of neutral lithium beam.** Jakubka, K. (Ceskoslovenska Akademie Ved, Prague (Czech Republic). Ustav Fyziky Plazmatu); Zacek, F.; Stoeckel, J.; Badalec, J.; Svoboda, V. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. Grant CSAS 14308. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes a small diagnostic source of Li, Mg and Al atoms. Atoms are produced by a controlled arc discharge using a hollow cathode to prevent the emission of microparticles released from the cathode spots into tokamak plasma. Using an electrostatic and time-of-flight analyzers, the mass and energy of the atoms were determined. (author). 9 refs, 9 figs.

13978 (INIS-mf–13779, pp. 146-154) **Use of modelling to improve SINP tokamak discharges.** Ranjan, P. (Saha Inst. of Nuclear Physics, Calcutta (India)); Hui, A.K.; Paul, R.K. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Various models have been used to understand and improve the discharge behaviour of SINP tokamak, a small research tokamak. This has allowed us to achieve for the first time full designed parameters of this tokamak. To achieve this a low cost audio frequency discharge cleaning system using single turn primary was developed. The plasma current rise has been slowed down. A low cost soft- x-ray imaging system has shown very pronounced sawtooth oscillation in these discharges. (author). 7 refs, 7 figs.

13979 (INIS-mf–13779, pp. 155-172) **Edge density profile variation during a magnetic axis shift in the CHS Heliotron/Torsatron.** Ueda, M. (Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, SP (Brazil)); Iguchi, H.; Yamada, H.; Okamura, S.; Nishimura, K.; Kubo, S.; Matsuoka, K.; Fujita, J.; Sasaki, S. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The edge density profile was measured during natural and forced magnetic axis shift in a low-aspect-ratio heliotron/torsatron CHS, using an 8 keV fast neutral lithium beam probe. The Shafranov, shift of the magnetic axis (and hence the dislocation of the LCFS) that was negligible for a low density ECH discharge became substantial ($\approx$ 4.5 cm) for a high density NBI discharge ($< n_e > \approx 2.5 \times 10^{13}$ cm^{-3}) and the corresponding radius of the LCFS increased about 1.2 cm in the major radius direction compared to the vacuum case. For NBI discharges with different settings of the vacuum magnetic axis R_{ax} (fixed during the discharge), the measured edge density profiles indicated reasonable agreements between the theoretically and experimentally obtained LCFS radii for 90 cm $< R_{ax} <$ 101.6 cm while for $R_{ax} <$ 90 cm the measured radius was 10% larger than expected. When a change of R_{ax} from 94.7 cm to 89.9 cm during a discharge was imposed externally, a well behaved plasma boundary moved inward smoothly by about 7.5 cm, while the steepness of the edge density profile changed for different values of R_{ax}. the steepest profile was attained for R_{ax} = 92.1 cm when highest energy content and average density were achieved. (author). 15 refs, 8 figs.

13980 (INIS-mf–13779, pp. 185-192) **Formation of edge transport barrier in the heliotron/torsatron type device, CHS.** Toi, K. (National Inst. for Fusion Science, Nagoya (Japan)); Okamura, S.; Iguchi, H. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Control of rotational transform profile with a small ohmic heating (OH-) current to increase the rotational transform has led to a continuous rise in the line-averaged electron density with reduction of Hα-lights around the torus, in a heliotron/torsatron plasma heated by neutral beams. During the density rise, the transport barrier with steep temperature and density gradients near the plasma edge has been formed. Edge localized modes (ELM)-like activity is also observed. These observations are very similar to the H-mode in tokamaks, while the improvement of global energy confinement is not significant, i.e., by $\approx$ 15%. There is a threshold of the current for the transition, where the increment of rotational transform by the threshold current corresponds to $\approx$ 0.1 at the edge. No obvious increase int he edge poloidal rotation velocity, however, is observed during the density rise phase, that is, at most $\approx$ 3 km/s. (author). 16 refs, 3 figs.

13981 (INIS-mf–13779, pp. 193-215) **Collisional radiative model for H_2 molecules in a tokamak boundary plasma.** Hailu, G. (Addis Ababa Univ., Addis Ababa (Ethiopia). Dept. of Physics); Reiter, D. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

Edge plasma cooling due to the interaction of recycling neutral particles near limiters and diverters targets with the scrape off layer is an important effect to reduce the heat load on Tokamak vessel components. Furthermore, the details of the neutral particle transport may play a crucial role for particle removal, refueling, and impurity retention (by formation of local plasma flow reversal) in Tokamaks. The relevant atomic data for hydrogenic atoms are well established, whereas the database for molecules is much less complete. Therefore, in this report, we review and extend the model for collisional radiative processes involving hydrogen molecules in the edge plasma boundary. Effective dissociation and dissociative ionization rate coefficients are calculated. Rate coefficients for production of neutral atoms from hydrogen molecules are also evaluated. Finally, the rate of electron energy loss per dissociation of molecules into atoms (and/or) ions is calculated. (author). 30 refs, 6 figs.

13982 (INIS-mf–13779, pp. 216-222) **Numerical solution of the second-order complex eigen differential equation and integral equation in plasma physics.** Wang Shijin (Academia Sinica, Beijing, BJ (China). Inst. of Physics); Shen Jauwu. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at*

the IAEA technical committee meeting. Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

This is a paper about calculating plasma physics in which we refer to the method given by (1) and (4) to solve a complex second-order eigen differential equation and integral equation in plasma physics, the numerical techniques and code are included. (author). 4 refs.

13983 (INIS-mf–13779, pp. 233-240) **Ballooning mode stability of high-β tokamaks with elongation and triangularity.** Agarwal, A.K. (Institute for Plasma Research, Bhat, Gandhinagar (India)); Bhattacharyya, S.N.; Sen, A. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The effect of elongation and triangularity of flux surfaces on the local and global stability of high-n ideal ballooning modes in a high-β tokamak are investigated. The equilibrium surfaces are obtained by a numerical solution of the Grad-Shafranov equation using an efficient algorithm based on a generalized variational technique. A marginal stability analysis of these surfaces is carried out in which the equilibrium shift, elongation, triangularity and their radial variations are taken into account. The influence of the q-value at the plasma boundary (q_a), as well the variations in the shape of β and q profiles, on the maximum attainable beta value (β_c) are also considered. Detailed numerical results, over a wide range of parameter space, show that the effect of boundary elongation k_a is always stabilizing while the effect of boundary triangularity δ_a depends on the values of k_a and q_a. It is found that for elongated cross section ($k_a \geq 1.6$), the effect of δ_a is always stabilizing. For a JET type plasma, broad β profiles and q profiles that tend to be flat in the interior are found to be favourable for achieving a high β_c value. (author). 18 refs, 6 figs, 1 tab.

13984 (INIS-mf–13780, pp. 50-52) **Unification of I C F-μD T fusion systems.** Eskandari, M.R. (Shiraz Univ., (Iran, Islamic Republic of) Dept. of Physics). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. INERTIAL CONFINEMENT/deuterium tritide; MUON-CATALYZED FUSION/deuterium tritide; DEUTERIUM; NUMERICAL SOLUTION

13985 (INIS-mf–13799, pp. 1-16) **LIDAR Thomson scattering. Report on the IAEA technical committee meeting held at JET Joint Undertaking, Abingdon, UK, 8-10 April 1991.** Gowers, C.W. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking). International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

This fifteen-page opening document of the collection of papers on LIDAR Thomson scattering as a plasma diagnostic tool contains a summary of the meeting; including a discussion of existing LIDAR systems applied to the JET tokamak, of lasers and laser developments, of detectors and analysis methods, and of LIDAR systems for future devices such as the ITER tokamak.

13986 (INIS-mf–13799, pp. 17-29) **The JET LIDAR system now.** Gowers, C. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Brown, B.; Gadd, A.; Nielsen, P.; Schunke, B.; Hirsch, K.; Salzmann, H. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

The time of flight or LIDAR approach to the measurement of T_e and n_e profiles by Thomson scattering was first demonstrated on the JET tokamak in preliminary form in 1986. These first single shot, 4 channel measurements were followed in 1987 with results from the full 1/2 Hz repetition rate, 6 channel temperature and density profile system. The diagnostic uses a 300 ps ruby laser and MCP photomultipliers detectors coupled to fast transient recorders. The spatial resolution achieved initially was 12-13 cm. The advantages of the LIDAR technique over conventional Thomson scattering were apparent from the beginning. Short detection integration times gave low plasma light levels and therefore good signal to noise ratios. This also allowed comparatively large scattering volumes to be used resulting in insensitivity to misalignment. These factors, combined with the simplicity of the optical system close to the tokamak and the relatively undemanding access requirements, have made it possible to consider Thomson scattering as a viable diagnostic technique for the next generation of fusion devices. Several enhancements to the performance of the original LIDAR system have been considered both in terms of the spatial resolution (now < 10 cm), the repetition rate and the reliability of the measurements. The key features of the JET LIDAR system and progress on these improvements will be reviewed. (author). 22 refs, 11 figs, 4 tabs.

13987 (INIS-mf–13799, pp. 31-50) **High resolution LIDAR Thomson scattering at JET.** Fajemirokun, H. (Imperial College of Science, Technology and Medicine, London (United Kingdom)); Gowers, C.; Nielsen, P.; Hirsch, K.; Kajiwara, T.; Salzmann, H. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A high resolution LIDAR Thomson scattering system for JET has been designed, using a streak camera detection system. The best achievable spatial resolution of the existing LIDAR system is 9-10 cm. There is a need for higher resolution than is presently achievable in order to resolve the density and pressure gradients at the plasma edge during H-mode operation of JET. An additional motivation is the possibility of taking high resolution LIDAR snapshots of islands in the core of the plasma. It has been reported that by using a streak camera system, resolution of better than 4 cm is in principal possible, over a limited part of the plasma radius. Some feasibility experiments were carried out during a portion of the last JET period of operations (1:9:90 - 3:11:90). A Hadland 675 Imacon streak camera and 50/40 intensifier formed the detection system, and a Tektronix DCS digitizing CCD camera system recorded the data and transferred it to a PC for analysis. Results obtained on the stray light signature, plasma light levels and our initial attempts to record scattering results are reported here. In addition, some general problems encountered in the operation of the detection system and the interpretation of data are discussed. (author). 3 refs, 8 figs.

13988 (INIS-mf–13799, pp. 87-101) **NP:PH glass laser and registration system for LIDAR Thomson scattering.** Golberg, S.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Goltsov, A.Yu.; Kolomijsky, A.N.; Pergament, M.I. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A one-channel prototype of a Neodymium laser based LIDAR Thomson scattering system is being experimentally tested at the time of this brief report. The design incorporated the necessity (i) to increase the beam cross section for the compensation of self-focusing, (ii) to apply laser radiation filtering for the elimination of the most dangerous spatial modes, (iii) to provide a proper laser pulse shape (> 100 ps) through the use of electro-optical shutters, (iv) to achieve a beam divergence below about one half of one

milli-rad (with a wavelength variation below one Angstrom and a depolarization level less then 0.5 percent) and a high intensity distribution uniformly across the KDP crystal in order to efficient frequency conversion output, and (v) to achieve compact and high reliability of the system as a whole. The laser design parameters are suitable for the effective conversion of the laser radiation into the second harmonic with at least 60 percent efficiency. For the development of a laser system with output parameters on the level of 3 to 5 Joule for energy and 30-50 ps for the pulse time, because self-focusing constrains the intensity of laser media to 1-3 GWt per square cm, the output active elements aperture must be of the order of 100 square cm. Because the energy flux would be of the order of 0.1 Joule per square cm, implying poor extraction efficiency, multi-pulse plasma probing is subsequently discussed here. Signal-to-noise analysis of the plasma-scattered laser radiation shows that the multi-pulse probing enables to diminish the exit aperture by order of magnitude, thereby making the method feasible for plasma diagnostic applications. 2 refs, 5 figs.

13989 (INIS-mf–13799, pp. 103-111) **Diagnostic Nd:Laser with composed aperture and non-linear elements.** Belousov, V.N.; Mamin, A.M.; Nizienko, Yu.K. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A neodymium-laser-pumped Raman laser is proposed. The main features and specifications of the characteristics such as energy, aperture, pulse duration, efficiency of each of the lasers involved in this concept are listed and discussed briefly. 3 refs, 3 figs.

13990 (INIS-mf–13799, pp. 113-130) **LIDAR using fundamental and 2nd harmonic Nd-laser light.** Schunke, B. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Gowers, C.; Nielsen, P.; Hirsch, K.; Salzmann, H. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

The features of a LIDAR system based on a frequency-doubled Neodymium YAG Laser are presented. With a diagnostic set-up using simultaneously the fundamental wavelength and the frequency doubled output of the laser, a broad range of temperatures is accessible, making the diagnostic system feasible not only for the bulk plasma but for the outer regions as well. Advantage can be taken of the different polarisations of the two wavelengths generated by the Neodymium laser, the detection system can then be divided into two different detection paths, one for high and the other for low temperatures. Based on the expected plasma parameters of a next step experiment the proposed performance of such a system is simulated. The advantages of a two wavelength system are discussed and a lay-out for a feasible diagnostic system for a next step machine is presented. (author). 6 refs, 10 figs, 2 tabs.

13991 (INIS-mf–13799, pp. 131-146) **Scancross - A new chronographic image intensifier for highly sensitive optical oscilloscope and LIDAR detection system.** Surovegin, A.L. (Radian R and D Center, Moscow (Russian Federation)); Dashevsky, B.E. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Results obtained in the development of image-intensifier tubes capable of measuring low-intensity ultra-fast light phenomena are communicated. Requirements for subnanosecond and picosecond photosensors for applications in plasma diagnostics are delineated. This brief paper includes a survey of existing systems, some new approaches, prerequisites and a description of a Scancross-type device, the Scancross tube operating principle, electrical support systems, and some preliminary results. 7 figs.

13992 (INIS-mf–13799, pp. 147) **Gated optical detectors for LIDAR applications.** Dymoke Bradshaw, A.K.L. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. OPTICAL RADAR/image intensifiers; PLASMA DIAGNOSTICS/optical radar; PULSES

13993 (INIS-mf–13799, pp. 149-162) **Experimental investigation of the AGAT streak-camera application possibilities in the LIDAR Thomson scattering diagnostics.** Gusev, V.K. (AN SSSR, Leningrad (Russian Federation). Fiziko-Tekhnicheskij Inst.); Mukhin, E.E.; Razdobarin, G.T.; Konenko, P.O. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

The data on experimental testing of the electron-optical AGAT streak-camera specification are presented. The amplification, gating ratio and signal-to-noise ratio performance of the streak-camera are discussed and measured. It is shown that the discrimination of the weak scattered signal against the preceding strong one with the peak power around 10^7 times too large is achievable. This property which is peculiar to the AGAT streak-camera is caused by the local saturation of MCP intensifier. Some requirements to the streak-camera specification parameters are formulated on the basis of the experiments. (author). 6 refs, 3 figs.

13994 (INIS-mf–13799, pp. 163-168) **LIDAR system combined with streak camera.** Toshinori Kajiwara (Kyushu Univ., Kasuga Fukuoka (Japan). Dept. of Energy Conversion); Masayuki Yoshida; Kiichiro Uchino; Mitsuharu Masuda; Katsunori Muraoka; Mitsuo Maeda. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A LIDAR system combined with a streak camera was investigated to get higher spatial resolution than the present LIDAR on JET (spatial resolution 100 mm). In order to realize the system, i) confirmation of the detection limit of a streak camera and ii) optimization of the system were necessary. Regarding i), we estimated the Signal-to-Noise ratio of a streak system with a CCD camera for read out of the streak image theoretically and checked the estimation by observing Rayleigh scattering using a sub-ns YAG laser/SHG. The results showed that the Signal-to-Noise ratio of the system near the detection limit was dominated by read out noise and dark current of the CCD chip and it could be improved to the value determined by photon statistics by getting sufficient light gain at the streak stage. Regarding ii), the observable length along the laser beam is determined by a) a spot size of the observation volume at the entrance slit of the streak camera, b) length of the output screen of the streak tube, and c) streak speed. On the other hand, loss of scattered light due to vignetting becomes larger when the spot size is made smaller. Therefore, the system was optimized to get as long an observable length as possible under the constraint of deterioration of the detection limit due to vignetting. A grating spectrometer was shown to be feasible for certain conditions. (author). 6 figs.

13995 (INIS-mf–13799, pp. 169-191) **Detectors for LIDAR type Thomson scattering diagnostics.** Hirsch, K. (Stuttgart Univ. (Germany). Inst. fuer Plasmaforschung). International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

A report on the capability of the microchannel plate photomultiplier type (ITT F4128) presently used at the JET LIDAR Thomson Scattering System is given. Detailed investigation on time response, low noise amplification, shutter ratio, gating behaviour, linear mode of operation and saturation pulse recovery carried out during the design phase for LIDAR are presented. New investigation with respect to dc-and gated operation showed no measurable changes in sensitivity of this MCP photomultiplier. Comparing this type of detector with other MCP photomultipliers and with streak cameras some detection schemes for future LIDAR type diagnostic are proposed. (author). 24 refs, 15 figs, 5 tabs.

13996 (INIS-mf–13799, pp. 193) **High repetition rate microchannel-plate photomultipliers.** Giudicotti, L. (Padova Univ., Padova (Italy). Dipt. d'Ingegneria Elettrica); Bassan, M.; Sardella, A. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

In this contribution we describe the development of microchannel plate (MCP) photomultipliers with a recovery time of the order of 10^{-5} s, two orders of magnitude smaller than in conventional MCP detectors. In these detectors a short recovery time has been achieved by using an electron multiplier made of low resistivity MCPs, capable of operating at a strip current density as high as 130 $\mu A/cm^2$, in pulsed conditions. The thermal characteristics of a 25 mm prototype detector have been investigated experimentally, finding a thermal coefficient of the resistivity of 0.68 %/deg. C (at 20 deg. C), a thermal capacitance of 0.93 $\pm$ 0.06 J/deg. C and a thermal time constant of 175 $\pm$ 20 s. The electrical behaviour was investigated measuring a maximum output charge in linear regime of 25 pC (at 10^6 gain) and a recovery time of 50 μs. A numerical model was also developed that describes in a very satisfactory way the observed gain saturation due to the charge depletion of the microchannel walls. A rise time as fast as in conventional MCP can be obtained in this type of detectors, so that they may be used for high repetition rate LIDAR Thomson scattering, provided a suitable laser source is available. (author). (abstract only).

13997 (INIS-mf–13799, pp. 195) **Prospects for LIDAR as a real time control system.** International Atomic Energy Agency, Vienna (Austria); Commission of the European Communities, Abingdon (UK). JET Joint Undertaking. Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. JET TOKAMAK/plasma diagnostics; PLASMA DIAGNOSTICS/optical radar; PLASMA DIAGNOSTICS/thomson scattering

13998 (INIS-mf–13799, pp. 197) **Non-linear optical effects in Raman calibrations of Thomson scattering systems.** Giudicotti, L. (Padova Univ., Padova (Italy). Dipt. d'Ingegneria Elettrica); Bassan, M.; Pasqualotto, R. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

In this contribution we present the results of an investigation of the limits imposed by non-linear optical effects to Raman calibrations of Thomson scattering systems. When these effects take place Raman calibration is impossible because the intensity of the Raman lines is unpredictable. The Thomson scattering system of the ETA BETA II experiment has been used for Raman scattering measurements in H_2 and D_2 up to atmospheric pressure. A scattering signal undoubtedly due to stimulated Raman scattering was observed at the stronger Stokes transitions, for filling pressures above 230 and 500 mbar for H_2 and D_2 respectively. This light is not originated from the scattering volume but is detected as diffused light into the vacuum chamber. Calculations of the self-focusing critical power and the steady-state Raman gain were carried out to explain the observed phenomena, suggesting that in our conditions significant power conversion to the first Stokes wavelength takes place in to the vacuum chamber, near the beam dump. These results show that for a given experimental condition, non-linear optical effects impose an upper limit to the filling pressure for Raman calibrations of Thomson scattering systems. These effects should be considered when planning a Raman scattering calibration experiment and may be important in LIDAR Thomson scattering systems, due to the high peak power of the short laser pulse. (author). (abstract only).

13999 (INIS-mf–13799, pp. 201) **Aspects of LIDAR for the next generation of fusion experiments (ITER).** Salzmann, H. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany)). International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. ITER TOKAMAK/plasma diagnostics; OPTICAL RADAR/design; PLASMA DIAGNOSTICS/optical radar; PLASMA DIAGNOSTICS/thomson scattering; DESIGN; SPATIAL RESOLUTION

14000 (INIS-mf–13799, pp. 203) **The JET divertor LIDAR system.** International Atomic Energy Agency, Vienna (Austria); Commission of the European Communities, Abingdon (UK). JET Joint Undertaking. Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. JET TOKAMAK/plasma diagnostics; PLASMA DIAGNOSTICS/divertors; PLASMA DIAGNOSTICS/optical radar; PLASMA DIAGNOSTICS/thomson scattering; DESIGN; DIVERTORS

14001 (INIS-mf–13799, pp. 205-209) **Hybrid LIDAR system for ITER divertor plasmas diagnostics.** Moskalenko, I.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Berlisov, A.B.; Shcheglov, D.A. International Atomic Energy Agency, Vienna (Austria). Jul 1991. 214p. (CONF-9104411–: IAEA Technical Committee meeting on LIDAR Thomson scattering, Abingdon (United Kingdom), 8-10 Apr 1991). In *LIDAR Thomson scattering: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621576. Source: OSTI; NTIS (US Sales Only); INIS.

Time-of-flight Thomson scattering was adopted as the preferred method for obtaining electron temperature and plasma density profiles on ITER for core, edge, and divertor diagnostics. A LIDAR was also chosen for measuring atomic densities in the divertor region by near-resonant Rayleigh scattering. Feasibility studies of this technique include estimates of the scattering cross section at high laser intensities typical for LIDAR applications to plasma diagnostics. Good spatial resolution (less than 2 cm) is expected by the application of this technique to electron parameter diagnostics in the divertor region for densities above 10^{19} per cc. 8 refs, 3 figs.

14002 (INIS-mf–13810) **Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.** International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

This document contains a collection of 26 papers on "Microwave Reflectometry for Fusion Plasma Diagnostics", presented at the IAEA Technical Committee Meeting of the same name held at the JET Joint Undertaking, Abingdon, United Kingdom, March 4-6,

1992. It contains five papers on the measurement of plasma density profiles, six papers on theory and simulations in support of the development and application of this type of plasma diagnostics, eight papers on the measurement of density transients and fluctuations, and seven on new approaches to reflectometry-based plasma diagnostics. Refs, figs and tabs.

14003 (INIS-mf–13810, pp. 1-10) **Fast sweep multiple broadband reflectometers on ASDEX and ASDEX-Upgrade.** Manso, M.E. (Euratom/IST Association, Lisbon (Portugal). Centro de Fusao Nuclear); Silva, A.; Serra, F. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Here we present the main characteristics of two reflectometric systems: 1) the ASDEX system, in operation between December 1988 and August 1990; ii) the ASDEX Upgrade system presently under development. (author). 2 refs, 6 figs, 3 tabs.

14004 (INIS-mf–13810, pp. 11-20) **Measurement of density profiles using the multichannel reflectometer at JET.** Sips, A.C.C. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Costley, A.E.; Prentice, R.; Kramer, G.J.; Beurskens, M. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A reflectometer with twelve probing frequencies in the range 18 to 80 GHz is used on JET. In this paper we report on our experience in using the device to measure density profiles. In order to achieve routine and reliable operation modifications of the hardware were necessary, and a special mode of operation (sweep/dwell) had to be developed, in order to overcome the effects of density fluctuations. Also, accurate calibration techniques had to be developed. In general, these have been successful and the device now produces density profiles routinely on a wide range of JET pulses. Systematic comparisons have been made with profiles measured by other diagnostics, principally LIDAR Thomson scattering and the multichannel far infrared interferometer. In the paper, we present details of the developments and the results of the comparisons with other diagnostics. (author). 5 refs, 8 figs.

14005 (INIS-mf–13810, pp. 21-30) **Reflectometry experiment on the tokamak TORE-SUPRA.** Paume, M. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Chareau, J.M.; Clairet, F.; Zou, X.L. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Reflectometry experiments on TORE-SUPRA is designed to measure routinely the electron density profile of the plasma and to follow all change in the gradient. Broadband technique is used, and, the frequency range is 25-75 GHz for the O mode allowing us to measure densities between 8.5 10^{-8} and 6.8. 10^{-19} m^{-3}. X mode technique is under development with a frequency range of 75-110 GHz. It will be used for the determination of the density near the scrape-off layer according to previous experiments and, fixed frequency measurements for fluctuation studies. After a brief theoretical recall, an overview of the experimental set-up, detection technique, and signal analysis method is given, followed by some experimental results. 7 figs.

14006 (INIS-mf–13810, pp. 31-37) **X-mode 37 GHz reflectometry on the "Uragan-3M" torsatron.** Pavlichenko, O.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Pavlichenko, R.O.; Skibenko, A.I. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Measurements of electron density profile via microwave reflectometry using plasma probing by EM waves with ordinary (O) mode polarization are widely used for both tokamaks and stellarators. Extraordinary (X)-mode probing is less common because the refraction index of this wave depends on an additional parameter - magnetic field. In tokamaks the total magnetic field depends strongly on plasma current profile and is unknown a priori. It is not a case for stellarators where plasma influence on the total magnetic field distribution is weak (of order of beta). This allows to reconstruct the electron density profile from measurements of X-mode cut-off position versus probing frequency using data of the vacuum magnetic field calculation along the wave trajectory. 3 refs, 5 figs.

14007 (INIS-mf–13810, pp. 38-47) **Profile evaluation techniques for O-mode broadband microwave reflectometry on ASDEX.** Manso, M.E. (Euratom/IST Association, Lisbon (Portugal). Centro de Fusao Nuclear); Nunes, F.; Silva, A.; Leitao, J.; Varela, P. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Density profiles from reflectometry can be obtained, in principle, with phase or time delay measurements. In the first case frequency-modulated continuous waves (FM-CW) are launched into the plasma, and in the second one different types of signals, namely pulses, are used. Whereas in the ionosphere density profiles are normally obtained with pulsed radar techniques, in fusion plasmas FM-CW reflectometry has been mostly used. In both techniques the localization of each reflecting layer cannot be deducted from single measurements as, for the same measured phase shift or time delay, the location depends on the density of the plasma that the waves have encountered in their propagating path. So, in order to determine the correct position of each layer all the layers with lower densities have to be probed. As microwaves are very sensitive to plasma modes and broadband turbulence the resulting phase or time delay perturbations may lead to the incorrect interpretation of the data, causing large errors in the evaluated profiles. Also, in some cases, it is not possible to probe the complete plasma and deviations may occur due to the missing information. The evaluation of the profiles must, therefore, include data analysis procedures that take into account both the effect of plasma fluctuations and the limitations of the diagnostic. Here we present the techniques developed to analyse the ASDEX data, and discuss their potentialities for the routine evaluation of the density profiles from broadband reflectometry. (author). 3 refs, 12 figs.

14008 (INIS-mf–13810, pp. 48-57) **Relativistic effects in reflectometry.** Bindslev, H. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking). International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

The refractive indices and locations of cutoffs are investigated for cold, hot and relativistic plasma models. Significant relativistic modifications of refractive indices and locations of cutoffs are found in regimes relevant for reflectometry in large Tokamaks. It is demonstrated that these effects may shift the location of the reflecting layer by a significant fraction of the minor radius and that the cold model may lead to considerable underestimations of the density

profile when X-mode is used. Relativistic effects predicted for O-mode reflectometry are smaller than for X-mode, but not negligible. An algorithm for reconstruction of density profiles which allows a relativistic plasma model to be used is presented. (author). 7 refs, 5 figs.

14009 (INIS-mf–13810, pp. 58-67) **A numerical study of correlation reflectometry.** Michelsen, P. (Association EURATOM-Riso National Lab., Roskilde (Denmark)); Pecseli, H. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

In this report some basic features of the performance of a correlation reflectometer used as a diagnostic for random plasma fluctuations are studied. Using a realistic and tractable model for the plasma fluctuations we derived some analytical results for correlation and crosscorrelation functions for the temporally varying phase of the reflected signals. Numerical simulations were performed to illustrate the practical applicability of the basic ideas of the reflectometer. (author). 10 refs, 7 figs.

14010 (INIS-mf–13810, pp. 68-78) **Numerical simulation of fluctuation measurements by reflectometry.** Cripwell, P. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking). International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A full wave, one dimensional, model of the phase response of reflectometers to density fluctuations is presented. The model is based on obtaining numerical solutions to the electromagnetic wave equation in a turbulent dielectric medium using a differencing method. In order to test the accuracy of the model, its results are compared with analytic solutions of the wave equation. The model is used to determine the phase response of a single channel reflectometer and a two channel correlation reflectometer to density fluctuations. For the single channel device, it is concluded that it is only possible to obtain qualitative information on the density fluctuations. However, for the two channel correlation reflectometer it is shown that it is possible to determine, under certain conditions, the radial dispersion relation of the fluctuations and the radial correlation lengths. (author). 4 refs, 15 figs.

14011 (INIS-mf–13810, pp. 79-88) **One-dimensional full-wave analysis of reflectometry sensitivity and correlations.** Hutchinson, I.H. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center). International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A general analysis is presented of the sensitivity of reflectometry to perturbations of the plasma profiles, using a full-wave description in one-dimension. Correlation reflectometry is investigated. It is found that the phase correlation is substantial, regardless of the correlation length of the fluctuations, unless either the wave attenuation is substantial or else the fluctuation correlation function is non-monotonic, corresponding to narrow-band turbulence. This behaviour can be understood in terms of the relative importance of forward and backward scattering. (author). 14 refs, 6 figs.

14012 (INIS-mf–13810, pp. 89-96) **Numerical simulation of reflectometry experiments in one and two dimensions.** Holzhauer, E. (Stuttgart Univ. (Germany). Inst. fuer Plasmaforschung); Rohrbach, G. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

To calculate the propagation of electromagnetic waves in an inhomogeneous medium in one and two dimensions a spatial network is used, which represents the equivalent circuit for the propagation of electromagnetic waves in a plasma. This method has been used to describe the one-dimensional propagation of radio waves in the ionosphere, including absorption due to collisions. The method gives the full wave solution for arbitrary density profiles. The present brief paper includes a description of the divergence of the beam due to the density profile in the direction of propagation, changes in the phase of the reflectometry signal due to fluctuations propagating transversely, and the detection of radiation scattered at angles less than 180 degrees from transversely propagating fluctuations. It is concluded that further detailed studies of two-dimensional effects will have to be performed to fully assess the potential of reflectometry for fluctuation measurements in fusion plasmas. 2 refs, 8 figs.

14013 (INIS-mf–13810, pp. 97-100) **A note on the meaning of phase information for the measurement of fluctuations.** Holzhauer, E. (Stuttgart Univ. (Germany). Inst. fuer Plasmaforschung); Rhodes, T.L. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

This is a short note on the content of the reflected signal in reflectometry experiments for plasma diagnostics applications. In the presence of fluctuations the reflected signal consists of (i) a phase shift, (ii) a backscattering term not contained in Wentzel-Kramers-Brillouin approximations, and (iii) a forward scattering term due to transversely propagating density fluctuations. While information on the first of these terms follows from the phase of the reflected signal, information on backscattering can be derived from the electric field at the antenna, which consists of the attenuated backscattered field plus the attenuated reflected transmitter field. The phase fluctuation at the receiver due to backscatter depends crucially on the ratio of the amplitudes of these fields in a manner quantified here. 3 refs.

14014 (INIS-mf–13810, pp. 101-122) **Reflectometry as a diagnostic for density fluctuations: A comparison of laboratory and computer modeling results.** Rhodes, T.L. (California Univ., Los Angeles, CA (United States). Inst. of Plasma and Fusion Research); Baang, S.; Chou, A.E.; Domier, C.W.; Luhmann, N.C. Jr.; Peebles, W.A. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. COntract DE-FG03-86-ER53225. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Reflectometry is currently used to diagnose density fluctuations and turbulent correlation lengths in fusion plasmas. Various models have been used to both interpret the experimental data and to determine the regimes of validity of the reflectometer fluctuation measurements. However, these models have, heretofore, not been validated by direct comparison with experiment. In this paper the first comparison between a controlled laboratory experiment and a one-dimensional numerical model is presented. It is found that the model is unable to predict the observed high degree of spatial localization and dependence on perturbation wavenumber. The implications of these disagreements are discussed, together with suggestions for their resolution. (author). 28 refs, 4 figs, 1 tab.

14015 (INIS-mf–13810, pp. 123-132) **Measurements of MHD activity with reflectometry on ASDEX.** Manso, M.E. (EURATOM/IST Association, Lisbon (Portugal). Centro de Fusao Nuclear); Serra, F.; Silva, A.; Matias, J.; Soeldner, F.; Wagner, F.;

Zohm, H. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Density perturbations induced by MHD activity were studied with broadband and fixed frequency O-mode microwave reflectometry on ASDEX. The system operated in the frequency range 18-60 GHz, allowing to probe densities $n_e \approx 0.4 - 4.5 \times 10^{13}$ cm^{-3}. By obtaining from the broadband raw data the average phase shift radial pattern corresponding to the (indisturbed) plasma profile and the component due to fluctuations, the radial distribution of the fluctuations could be determined. With fixed frequency measurements the detailed temporal evolution of MHD modes at specific density layers could be estimated from the power spectra of the detected signals. Here we report on results obtained in Lower Hybrid Current Drive (LHCD) scenarios, and in H-mode discharges. (author). 4 refs, 14 figs.

14016 (INIS-mf–13810, pp. 133-142) **Broadband heterodyne reflectometry: Application to the W7-AS stellarator.** Sanchez, J. (Asociacion EURATOM/CIEMAT, Madrid (Spain)); Estrada, T.; Hartfuss, H.J. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A broadband heterodyne reflectometer, operating in the frequency range 75-110 GHz, has been installed and operated at the W7-AS Stellarator, for the study of density fluctuations and fast density profile determination. One of the main aims of the system is to allow for broadband operation, without the limitations of phase-locked sources. Both LO and RF oscillators can be swept over the whole frequency range. After a first IF stage in the range 5-8 GHz, several downconversion steps lead to a last IF (60 MHz), which is provided by a quartz oscillator and carries the phase delay from the plasma as a phase modulation. The phase information is detected by sin/cos detection around the 60 MHz carrier. The system offers broadband operation together with the possibility to decouple phase and amplitude oscillations of the reflected beam. In addition, the detection system shows a very high dynamic range (up to 80 dB) which is able to overcome the large amplitude oscillations of the reflected beam, phenomenon which causes very often loss of fringes in reflectometry systems. The reflectometer described offers a good basis for further developments on large devices, which will require a very high sensitivity due to the long waveguide runs, together with the advantage of the operation in a continuous frequency range and fast sweeping capability. After installation on W7-AS, first results reproduced the original findings of the former homodyne system (1): location of rational surfaces and coherent modes and a correlation between fluctuations and loss of optimum confinement. 3 refs, 11 figs.

14017 (INIS-mf–13810, pp. 143-156) **Measurement of density transients using the multichannel reflectometer at JET.** Kramer, G.J. (FOM-Instituut voor Plasmafysica, Rijnhuizen (Netherlands)); Sips, A.C.C.; Costley, A.E. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper we discuss the use of the multichannel reflectometer at JET for measuring density transients. We present data on the following topics: density pulse propagation and density fluctuations during the sawtooth crash, the change in the electron density profile and the fluctuations during the L to H transition, and the spatial localisation of MHD modes. (author). 6 refs, 10 figs, 1 tab.

14018 (INIS-mf–13810, pp. 157-167) **Measurements of ELMs and associated fluctuations with the multichannel reflectometer system.** Colton, A.L. (Association Euratom, Riso National Lab. (Denmark)); Cripwell, P.J. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

The potential and limitations of JET's Multichannel Reflectometer System for studying ELMs have been evaluated. Two new methods for calibrating fixed frequency data have been developed to cope with the problems caused by ELMs. Results on both the temporal and radial evolution of the ELMs and associated fluctuations are presented, and the significance of the relative proportion of phase and amplitude fluctuations is discussed. (author). 3 refs, 7 figs.

14019 (INIS-mf–13810, pp. 168-176) **Correlation reflectometry measurements at JET.** Cripwell, P. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Costley, A.E.; Fukuda, T. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Two correlation reflectometers are used on JET: a four channel radial correlation reflectometer and a two channel toroidal correlation reflectometer. Measurements are made for a wide range of plasma conditions -ohmic, H-mode and L-mode. The measurements suggest that fine scale density structures exist in the plasma. The clearest results are obtained under L-mode conditions when it appears that the structures grow radially under the action of additional heating and rotate toroidally with the plasma. Under ohmic conditions, no significant evidence of structures is observed. Under H-mode conditions, it appears that the structures have a relatively small radial extent and a significant poloidal component to their motion. An additional poloidal correlation reflectometer is required to determine this motion. (author). 8 refs, 10 figs.

14020 (INIS-mf–13810, pp. 177-183) **Determination of the radial correlation length of the density fluctuations by swept homodyne reflectometry in the TJ-I tokamak.** Sanchez, J. (Asociacion EURATOM/CIEMAT, Madrid (Spain)); Branas, B.; Luna, E. de la; Estrada, T. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A method for determination of radial correlation lengths of the electrostatic turbulence has been developed and applied to the TJ-I Tokamak. The method uses homodyne detection and is based on the slow sweeping of one oscillator while the other remains at fixed frequency. The decay of the coherence can be observed describing maxima and minima as the distance between the two probing points increases. The maxima correspond to the relevant coherence values. The correlation length for the overall turbulence as well as the correlation length for the different frequency intervals can be directly determined, providing a higher accuracy then the standard two-point measurement. By the operation in the Q-band (33-50 GHz) extraordinary mode, the system reaches most of the plasma radius. Correlation lengths obtained at the edge are compared with those measured at deeper positions in the plasma. A critical issue for this comparison is the detailed knowledge of the local density gradient. The proposed method can provide the density profile information, avoiding the effect of lost fringes, even in the presence of turbulence. This fact can be used to determine the local density gradient which is needed to evaluate the separation between both reflecting points. Initial experimental results and a discussion on its degree of accuracy is presented. (author). 3 refs, 6 figs.

14021 (INIS-mf–13810, pp. 184-194) **Using of cross-detection reflectometer for the turbulence study in the tokamak plasma.** Bulanin, V.V. (St. Peterburg Technical Univ., Leningrad (Russian Federation)); Korneyev, D.O. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Preliminary plasma edge turbulence investigations in the Tuman-3 tokamak were carried out by means of a simple homodyne reflectometer. It was found that the high-frequency spectral components of the turbulent fluctuations were drastically decreased just after the transition between L- and H-mode confinement similar to observations in the DIII-D tokamak. Typical phase and amplitude spectra are presented. However, plasma probing with different microwave frequencies shows that high-frequency fluctuation dumping occurs during the L- to H-mode transition only in an edge region, which seems to contradict the DIII-D results. A phase runaway effect was found that is similar to observations in stellarator plasmas. 4 refs, 12 figs.

14022 (INIS-mf–13810, pp. 195-203) **Design of a multichannel reflectometer for the RTP tokamak.** Heijnen, S.H. (Associatie Euratom-FOM, Nieuwegein (Netherlands). FOM-Instituut voor Plasmafysica); Hugenholtz, C.A.J.; Pol, M.J. van den. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A multichannel reflectometer is under construction for the RTP tokamak (RTP = Rijnhuizen Tokamak Project). The system will be heterodyne and is based on the experience gathered with the JET reflectometer system. However, on RTP a different approach will be used to generated and detect the multiple frequencies. The main reason for redesigning a working system is the fact that the total costs of the system are about a factor of three less than that of the corresponding JET reflectometer. The system is especially suited for use on small tokamaks. 4 refs, 6 figs, 4 tabs.

14023 (INIS-mf–13810, pp. 204-211) **New radar technique applied to electron density measurement on fusion plasmas.** Millot, P. (ONERA/CERT/DERMO, Toulouse (France). Microwave Dept.). International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A new radar system is presented. It can make very accurate measurements of times of flight of waves at different frequencies which are reflected by the plasma, thus allowing an evaluation of the electron density profile by the well known Abel inversion. 5 refs, 2 figs, 1 tab.

14024 (INIS-mf–13810, pp. 212-220) **Arbitrary density profile and Shafranov shift reconstruction in large tokamaks via dual-polarization reflectometry and magnetic diagnostics.** Bomko, A.V. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Grekov, D.L.; Pavlichenko, O.S. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A method is described to reconstruct plasma density profiles of arbitrary shape and to determine the Shafranov shift through measurements of phase delays of o- and x-waves and magnetic diagnostics data. The stability of this method with respect to errors in the measurement of the phase delays is also considered. 6 refs, 5 figs.

14025 (INIS-mf–13810, pp. 221-227) **Amplitude modulation reflectometry for density profile and fluctuations studies.** Sanchez, J. (Asociacion EURATOM/CIEMAT, Madrid (Spain)); Zhuravlev, V.; Luna, E. de la; Estrada, T.; Branas, B. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

One of the main problems which arises in density profile measurements by reflectometry is the need for continuous tracking of the phase delay: fast density fluctuations and strong modulation on the amplitude of the reflected signal usually bring to 'fringe jumps' in the phase signal. Amplitude Modulation Reflectometry performs a time delay measurement by the determination of the phase delay of the modulating envelope of a millimeter wave reflected by the plasma. The phase delays involved are small, the measurement is not affected by the fluctuations and can be directly performed without complicated fringe counters: the method provides a promising possibility for real time determination of the plasma position and density profile. In the present paper the principles of the method are presented as well as the analysis on the effects of phase and amplitude fluctuations, dispersive effects and accuracy requirements. The application to the future JET Divertor plasmas will be also presented together with an initial design of the system. (author). 3 refs, 2 figs.

14026 (INIS-mf–13810, pp. 228-235) **Technical aspects of a multichannel pulsed radar reflectometer.** Pol, M.J. van de (Associatie Euratom-FOM, Nieuwegein (Netherlands). FOM-Instituut voor Plasmafysica); Heijnen, S.H.; Hugenholtz, C.A.J. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

Pulsed radar reflectometry has been proposed as a viable option for measuring electron density profile in thermonuclear plasmas. Pulsed radar is based on the measurement of the time-of-flight between launching and receiving a short (< 1 ns) microwave pulse which is injected into the plasma and reflected by the cut-off layer. The flight time is directly related to the position of the cut-off density. Density profiles can be deduced by measuring the flight times of pulses with various frequencies. Additional information about the local density gradient can be gained from the pulse shape deformation during the reflection process. 5 refs, 4 figs.

14027 (INIS-mf–13810, pp. 236-251) **New approach to microwave reflectometry: Correlation reflectometry via stochastic noise signals.** Korosteljov, V.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Inst. Radiofiziki i Ehlektroniki); Lukin, K.A.; Rakitjanskiy, V.A.; Shestopalov, V.P.; Pavlichenko, O.S.; Pavlichenko, R.O. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

The main problem of microwave reflectometry using the measurement of the phase delay of reflected waves, i.e., density fluctuations and trapped modes in the oversized waveguide transmission systems, still require a solution. An alternative approach is discussed here, namely to use pulsed radar reflectometry and time-of-flight measurements. The difficulty in this approach, i.e., the need for pulses of less than one nanosecond, was successfully overcome. 5 refs, 11 figs.

14028 (INIS-mf–13810, pp. 252-256) **A 'comb' reflectometer: A simple device for determining the peak density in difficult experimental situations.** Costley, A.E. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Fessey, J. International Atomic Energy Agency, Vienna (Austria). 1992. 264p. (CONF-9203297–: IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics, Abingdon (United Kingdom), 4-6 Mar 1992). In *Microwave reflectometry for fusion plasma diagnostics: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94620118. Source: OSTI; NTIS (US Sales Only); INIS.

A simple 'comb' reflectometer which can provide some information on the electron density in difficult experimental situations is described. Results obtained with a four channel device which probes the X point region on JET are presented. Possible further developments are briefly discussed. (author). 2 refs, 3 figs.

14029 (INIS-RU–364, pp. 21) **Experimental study on the nuclear emission in phase transitions in systems with heavy water.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Gromenko, V.M.; Krutov, Yu.M.; Lysenko, N.I.; Filonenko, A.D.; Tsarik, A.A.; Shimko, E.E.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NEUTRON EMISSION/phase transformations; CHEMICAL REACTIONS; HEAVY WATER; PHOTOEMISSION

14030 (INIS-RU–364, pp. 23) **Stimulation of cold fusion reactions in a palladium target saturated by deuterium under effect of external ionizing radiation.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/physical radiation effects; ACOUSTIC MONITORING; CESIUM; DEUTERIUM; FISSION FRAGMENTS; IONIZING RADIATIONS; NUCLEOSYNTHESIS; PALLADIUM; SEMICONDUCTOR DETECTORS

14031 (INIS-RU–364, pp. 24) **Experiments on searching for fine timing correlation of nuclear, acoustic and electromagnetic emission signals in cold fusion reactions.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Degtyarev, A.P.; Prokopets, G.A.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/correlations; ACOUSTIC MONITORING; CHARGED PARTICLE DETECTION; ELECTROLYSIS; GAMMA RADIATION; NEUTRON DETECTION; NIOBIUM; NUCLEOSYNTHESIS; CORRELATIONS; PALLADIUM

14032 (INIS-RU–364, pp. 25) **Observation of correlations of nuclear, acoustic and electromagnetic emissions under effect of electrolytic saturation of palladium with deuterium.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Merzon, G.I.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/correlations; ACOUSTIC MONITORING; COINCIDENCE METHODS; DEUTERIUM; ELECTROLYSIS; ELECTROMAGNETIC RADIATION; NUCLEOSYNTHESIS; CORRELATIONS; PALLADIUM; PROTON DETECTION

14033 (INIS-RU–364, pp. 26) **Experiments on the nuclear and acoustic emission detection in deuterium saturated metallic and intermetallic compound samples.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Artemenko, Yu.A.; Gol'tsov, A.V.; Gol'tsov, V.A.; Volkov, A.F.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/acoustic monitoring; NUCLEOSYNTHESIS/neutron detection; CESIUM COMPOUNDS; COBALT COMPOUNDS; DEUTERIUM; INTERMETALLIC COMPOUNDS; NIOBIUM; NUCLEOSYNTHESIS; PALLADIUM

14034 (INIS-RU–364, pp. 31) **Study on nuclear reaction products yield in the metal-deuterium systems.** Kuz'min, R.N.; Kuprin, A.P.; Revokatov, P.O.; Sakharov, E.M.; Shvilkin, E.N. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/deuteron reactions; NUCLEOSYNTHESIS/fusion yield; BETA DECAY; DIFFUSION; ENERGY SPECTRA; ETCHING; METALS; NUCLEOSYNTHESIS; PALLADIUM; SURFACES; TITANIUM; TRITIUM

14035 (INIS-RU–364, pp. 32) **Experimental study on nuclear emission under ultrasonic cavitation ion systems with heavy water.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Lysenko, Ya.I.; Filonenko, A.D.; Tsarik, A.A.; Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In

Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEAR REACTION YIELD/cavitation; BACKGROUND RADIATION; CORRELATIONS; DAMPING; HEAVY WATER; CAVITATION; PHOSPHORS; PROTON DETECTION; RADIATION DETECTION; SOUND WAVES; TRITIUM

14036 (INIS-RU--364, pp. 33) **Tritium detection in products of high-voltage nanosecond breakdown of heavy water.** Vershinin, Yu.N.; Emlin, R.V.; Lisovskikh, V.G.; Gorodetskij, V.G.; Rech, T.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/tritium meters; BREAKDOWN; DIELECTRIC MATERIALS; HEAVY WATER; NUCLEOSYNTHESIS

14037 (INIS-RU--364, pp. 34) **Experimental study on the model of cold fusion.** Bazhutov, Yu.N. (AN SSSR, Moscow (Russian Federation). Inst. Fizicheskoj Khimii); Kuznetsov, A.V.; Chertov, Yu.P.; Saunin, E.I.; Khodyakov, A.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. NUCLEOSYNTHESIS/electrolysis; ELECTRODES; MATHEMATICAL MODELS; NUCLEOSYNTHESIS; ELECTROLYSIS; TIME DEPENDENCE; TITANIUM; TRITIUM; X RADIATION

14038 (INIS-RU--364, pp. 36) **Detection of tritium and other products of low-energy nuclear synthesis in solids.** Romodanov, V.A. (Nauchno-Issledovatel'skij Fiziko-Khimicheskij Inst., Moscow (Russian Federation)); Savin, V.I.; Shakhurin, M.E.; Fedorov, Eh.M.; Skuratnik, Ya.V. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 3 refs. TRITIUM/deuteron reactions; TRITIUM/nucleosynthesis; NEUTRON DETECTION; NIOBIUM; PLASMA; SOLIDS; TARGETS; TRITIUM; NUCLEOSYNTHESIS; VANADIUM

14039 (INIS-RU--364, pp. 37) **Electrochemical aspects of cold fusion.** Baraboshkin, A.N. (AN SSSR, Sverdlovsk (Russian Federation). Inst. Ehlektrokhimii). AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. NUCLEOSYNTHESIS/electrochemistry; DEUTERIUM; ELECTROLYSIS; NUCLEOSYNTHESIS; ELECTROCHEMISTRY

14040 (INIS-RU--364, pp. 38) **Possibility of optimal planning of complex experiment for revealing effect of cold fusion and its mechanism.** Gordadze, G.P. (AN Gruzinskoj SSR, Tbilisi (Georgia)); Agladze, T.R.; Sigua, K.I. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLD FUSION/experiment planning; ACCURACY; CHARGED PARTICLE DETECTION; OPTIMIZATION; PLANNING; QUANTITATIVE CHEMICAL ANALYSIS; THERMONUCLEAR REACTIONS

14041 (INIS-RU--364, pp. 40) **On possible geological manifestations of cold fusion.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Tsarev, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 2 refs. NUCLEOSYNTHESIS/oceanic crust; DEUTERON REACTIONS; GEOLOGY; HELIUM 3; NUCLEOSYNTHESIS; PALLADIUM; SEAS; TRITIUM; WATER

14042 (INIS-RU--364, pp. 41) **Accelerating-crack model of cold fusion.** Golubnichij, P.I. (Luganskij Mashinostroitel'nyj Inst., Lugansk (Ukraine)); Filonenko, A.D.; Tsarik, A.A.; Tsarev, V.A.; Chochin, V.A. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282--: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion"*. Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COLD FUSION/cracks; COLD FUSION/mathematical models; ACCELERATION; CRACKS; DEUTERIUM IONS; ELECTRIC FIELDS; THERMONUCLEAR REACTIONS

14043 (INIS-RU--364, pp. 42-43) **Model of cold fusion under effect of catalysis of erosions.** Bazhutov, Yu.N.; Vereshkov, G.M. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR,

Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 16 refs. NUCLEOSYNTHESIS/catalysis; NUCLEOSYNTHESIS/mathematical models; DEUTERON REACTIONS; HADRONS; IRRADIATION; NUCLEOSYNTHESIS; CATALYSIS

14044 (INIS-RU–364, pp. 44) **Possible role of cold fusion induced by catalysis of ersions in the physics of Sun and planets.** Bazhunov, Yu.N.; Vereshkov, G.M. AN SSSR, Moscow (Russian Federation); Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation); AN SSSR, Moscow (Russian Federation). Fizicheskij Inst.; Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1991. 74p. (In Russian). (CONF-9103282–: Working seminar on fusion reactions in condensed matter and all-union conference on cold fusion; Working seminar on "Fusion reactions in condensed matter" and All-union conference on "Cold fusion", Dubna (Russian Federation); Moscow (In *Summaries of reports of working seminar "Fusion reactions in condensed matter" and All-union conference "Cold fusion".* Order Number DE94612618. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. 1 ref. COLD FUSION/planets; COLD FUSION/sun; CATALYSIS; PLANETS; SUN; CORRELATIONS; HADRONS; NEUTRINOS; THERMONUCLEAR REACTIONS

14045 (INIS-RU–370, pp. 64-68) **Application of the stationary neoclassical sources adjustable model to the ATF torsatron plasma heating.** Danilkin, I.S.; Mineev, A.B. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

Stationary plasma parameters profiles in terms of the neoclassical transport model including particle- and heat-sources adjustment are considered. These calculations are related to the plasma heating system scale planned for the ATF-device. It is shown that the required sources-adjustment can be achieved by means of a pellet-injection with technically acceptable parameters for the available light gas guns. We compare our results with prognostic calculations performed by means of the WHIST-code based on the essentially non-rigorous approach. 5 refs.; 8 figs.; 1 tab.

14046 (INIS-RU–370, pp. 69-75) **Free boundary plasma equilibrium in the U-2M torsatron.** Kuznetsov, A.B.; Kuznetsov, Yu.K.; Sychugov, D.Yu.; Shchepetov, S.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

Mainly numerical investigation of the equilibrium of plasma confined in the U-2M torsatron is carried out. It is shown that more rigid limitations on the value of the parameter β (β is the ratio of the plasma pressure to the pressure of magnetic field) follows from restrictions coming from changes in the rotational transform profile. Analytical expression for changes of rotational transform profile due to finite β effects is derived which can take into account the real structure of vacuum magnetic surfaces. The problem of reduction of the plasma domain size in presence of the limiter due to finite β effects, and the possibility of correction of the equilibrium by fields created by external coils are analyzed. 16 refs.; 7 figs.

14047 (INIS-RU–370, pp. 75-77) **Influence of inductor on stability of TSP plasma equilibrium along major radius.** Lukash, V.Eh.; Rozanova, I.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

With help of numerical simulation it is obtained the set of integral parameters determining the stability of the plasma column equilibrium TSR along major radius. It is carried out the analysis of stability from the condition of adiabatic compression. The conclusion is made of necessity to work with the high ratio of the plasma current to current inductor. 5 refs.; 6 figs.

14048 (INPE–4621) **Kinetic effects on the propagation characteristics of ion acoustic negative solitons.** Roberto, M.; Ludwig, G.O.; Bittencourt, J.A. Instituto de Pesquisas Espaciais (INPE), Sao Jose dos Campos, SP (Brazil). Jul 1988. 28p. (PRE–1342.). Order Number DE94618778. Source: OSTI; NTIS (US Sales Only); INIS.

The propagation characteristics of ion-acoustic negative solitons, in a multi-component plasma with negative ions, are investigated considering a Kinetic model which takes into account electron reflection and positive ion trapping in the negative potential well of the soliton. The Poisson equation is solved consistently using the Sagdeev potential formalism. It is verified that the kinetic effects associated with trapping of positive ions and reflection of electrons modify the results predicted by the simple Korteweg-de Vries fluid model in such a way that the Mach number is reduced as the ion temperature and the population of reflected electrons increase. (author).

14049 (IPP–6/316) **Lyapunov stability of large systems of van der Pol-like oscillators and connection with turbulence and fluctuations spectra.** Tasso, H. Max-Planck-Institut fuer Plasmaphysik, Garching (Germany). Apr 1993. 10p. (CONF-9305330–: Spring college on plasma physics, Miramare (Italy), 17 May - 11 jun 1993). Order Number DE94752358. Source: OSTI; NTIS (US Sales Only); INIS.

For a system of van der Pol-like oscillators, Lyapunov functions valid in the greater part of phase space are given. They allow a finite region of attraction to be defined. Any attractor has to be within the rigorously estimated bounds. Under a special choice of the interaction matrices the attractive region can be squeezed to zero. In this case the asymptotic behaviour is given by a conservative system of nonlinear oscillators which acts as attractor. Though this system does not possess, in general, a Hamiltonian formulation, Gibbs statistics is possible due to the proof of a Liouville theorem and the existence of a positive invariant or 'shell' condition. The 'canonical' distribution on the attractor is remarkably simple despite nonlinearities. Finally the connection of the van der Pol-like system and of the attractive region with turbulence and fluctuation spectra in fluids and plasmas is discussed. (orig.)

14050 (ITF–92-37R) **The energy density of fluctuative electromagnetic field near the semi-bounded plasma.** Zagorodnij, A.G.; Usenko, A.S.; Yakimenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 48p. (In Russian). Order Number DE94617188. Source: OSTI; NTIS (US Sales Only); INIS.

The general relations for the correlation functions of electromagnetic field near the semi-bounded non-isothermal plasma have been obtained. The spectral energy density of electromagnetic emission of plasma half-space into the outer transparent medium is calculated with the temperature of the outer medium and the field zero-oscillations in it taken into account. (author). 20 refs., 5 figs.

14051 (ITF–93-2R) **The pressure of fluctuative electromagnetic field in inhomogeneous medium.** Zagorodnij, A.G.; Usenko, A.S.; Yakimenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. (In Russian). Order Number DE94617189. Source: OSTI; NTIS (US Sales Only); INIS.

The spectral pressure density of fluctuative electromagnetic field on the boundary of plasma half-space is obtained. It is shown that the ponderomotive force on the boundary between two transparent media is directed in the region with less value of dielectric permittivity in the case care of thermodynamically equilibrium system. It

is determined that the ponderomotive force has the temperature independent component. (author). 18 refs.

14052 (ITP–93-13E) **On the theory of bounded many-particle systems with purely coulomb interactions.** Zagorodnij, A.G.; Heinzinger, K.; Yakimenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 12p. Order Number DE94617215. Source: OSTI; NTIS (US Sales Only); INIS.

The equilibrium distribution functions for bounded many-particle systems containing both free and bound charged particles have been calculated using a three-center molecular model with an arbitrary intrinsic potential of particle interaction. The general relations obtained are used for the description of particle density profiles and orientational distributions of molecules near a planar wall. (author). 11 refs.

14053 (IYaF–92-16) **Initial perturbations and Langmuir waves in electron-positron plasma.** Buchel'nikova, N.S.; Matochkin, E.P. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 26p. (In Russian). Order Number DE94617190. Source: OSTI; NTIS (US Sales Only); INIS.

The evolution of the initial density and velocity perturbations of a different type in the electron-positron plasma was studied in the numerical experiments (PIC-method). It was shown that the different perturbations lead to the excitation of the Langmuir wave and (or) the quasineutral density perturbation. It is shown that electron-positron plasma can be used as a model of the plasma of the equal mass negative and positive ions. 6 refs.; 14 figs.

14054 (IYaF–92-36) **Langmuir waves in the electron-positron plasma.** Buchel'nikova, N.S.; Matochkin, E.P. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 41p. (In Russian). Order Number DE94618779. Source: OSTI; NTIS (US Sales Only); INIS.

The numerical experiments (PIC-method) were made to study the evolution of the travelling Langmuir waves in the electron-positron plasma. In the case of small amplitudes the modulational instability leads to the formation of the Langmuir solitons, in the case of large amplitudes - to the collapse. The electron-positron plasma can be considered to be a model of the equal mass negative and positive ion plasma. 8 refs.; 22 figs.

14055 (IYaF–93-5) **Hot-ion plasma in the quadrupole trap.** Gilev, E.A.; Dimov, G.I.; Kabantsev, A.A.; Sokolov, V.G.; Taskaev, S.Yu. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1993. 21p. (In Russian). Order Number DE94617216. Source: OSTI; NTIS (US Sales Only); INIS.

Under filling up the 'AMBAL-U' mirror by plasma from quasi-stationary gas-discharge source without using of an additional heating methods, the hot plasma with density $3x10^{13}cm^{-3}$, ion temperature 1 keV, electron temperature 50 eV, and the β-parameter of 6% was obtained. In the case of working with deuterium the output of the thermonuclear neutrons was $\approx 10^8$ neutrons/s. Under the atomic H^0 beams ($E\simeq$ 17 keV, equivalent current 100 A, capture $\simeq$5%) injection into the obtained plasma the population of super ions with an average energy of 5 keV in volume of 4 liters is achieved. The density of this population on the whole volume increases during the injection pulse (200 μs) and becomes higher than $3x10^{12}cm^{-3}$ to the end of this period. 15 refs.; 11 figs.

14056 (JAERI-M–93-193) **Annual report of Naka Fusion Research Establishment for the period from April 1, 1992 to March 31, 1993.** Ohta, Mitsuru (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Naka Fusion Research Establishment); Shimizu, Katsuhiro; Fujii, Tuneyuki; Nishi, Masataka; Matoba, Tohru; Kanazawa, Tetsuo (eds.). Japan Atomic Energy Research Inst., Tokyo (Japan). Oct 1993. 143p. Order Number DE94748659. Source: OSTI; NTIS; INIS.

Research and development activities at Naka Fusion Research Establishment, JAERI, are reported for the period from April 1, 1992 to March 31, 1993. The main objectives of JT-60U experiments in FY1992 were to improve plasma confinement properties and to study non-inductive current drive. High-β_p H-mode performance obtained in March 1993 was highlighted, in particular, a world-record fusion-triple-product of 1.1×10^{21} $m^{-3} \cdot s \cdot keV$, and record values for JT-60 of neutron yield rate of 5.6×10^{16} s^{-1}, stored energy of 8.3 MJ, and H-factor of 3.6. The JFT-2M continued to study divertor biasing and ergodic limiter experiments, and disruption control by ECH. The study in Plasma Theory and Computation focused on scaling laws of the thermal energy confinement and the bootstrap current, the iron temperature gradient instability, the MHD stability, the rotation damping by external magnetic error field, and the burning plasma of $D-^3He$ fusion. As for the fusion engineering research, the vacuum technology advanced the development of a high resolution quadrupole mass spectrometer, etc. The super-conducting Demo Poloidal Coil achieved pulsed operation with 7 T in 0.5 s, and newly developed conductors made of Nb_3Al and Nb_3Sn showed 40 kA at 12 T and 82 kA at 13.6 T, respectively. A high energy H^- beam of 350 kV, 0.17 A was produced with a current density of 10 mA/cm^2. Much effort was made in developing the ECH gyrotron with an output power of 460 kW at 120 GHz for 100 ms. The main progress in the Tritium Systems Test Assembly (a US/Japan collaboration) was continuous loop run for 25 days. The developed plasma facing components posed no problem under a heat flux of 20 MW/m^2 for 30 s over 1000 thermal cycles. (J.P.N.).

14057 (Juel–2799) **A mechanism for the sawtooth collapse.** Rogister, A.; Li Ding. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Plasmaphysik; Association Euratom-Kernforschungsanlage Juelich GmbH (Germany). Jul 1993. 55p. Order Number DE94747513. Source: OSTI; NTIS (US Sales Only); INIS.

We have proposed a self-consistent picture of the sawtooth collapse according to which Kelvin-Helmholtz turbulence is responsible for rapid cross-field transport inside most of the hot spot. The K-H modes are driven by the sheared parallel flows which develop once localized sinks appear on the spot's field lines. Localized and sudden sinking action is assumed to result from the enhancement of trapped electron mode turbulence/TEM outwards transport by large density and temperature gradients developing in the neigborhood of the X line; the latter are inherent to the transient magnetic configuration generated by the tearing precursor. The time-scales of the K-H dynamics are short compared to the collapse time: the tubulence level can then adjust instantaneously. TEM turbulence steeply decreases inwards of the X line; we have assumed, for convenience, that the sink, localized at the azimuthal angel(s) of the X point(s), decreases as r^2. The collapse mechanism does not concern the outer rim of the hot spot where the pitch of the helicoidal field lines is too close to unity and their period too large. This can be put in parallel with the observation that the sawtooth inversion radius is smaller than the radius of the q=1 magnetic surface ($r_{inv}/r_1 \propto 0.9$ in TEXTOR). Cross-field and parallel transport are complementary; the latter vanishes on the spot's magnetic axis (ρ=0) and is maximum at the distance corresponding to the sawtooth inversion radius (ρ=1), the divergence of the former is maximum at ρ=0, decreases steadily outwards, vanishes for $\rho=1\sqrt{2}$, and has a negative minimum for ρ=1. (orig.)

14058 (LRP–483/93) **Effect of the parallel current density on the local ideal 3D MHD stability of HELIAS configuration.** Moeckli, R. (Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP)); Cooper, W.A. Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP). Oct 1993. 19p. Order Number DE94618780. Source: OSTI; NTIS; INIS.

We study the local ideal three-dimensional magnetohydrodynamic stability for the Wendelstein 7-X (W 7-X) configuration. We confirm a volume average beta limit of 5% with a nearly optimal pressure profile using two methods to calculate the parallel current density: the magnetic method that uses magnetic information of the configuration (in particular, the condition of charge conservation $\nabla.j = 0$ is explicitly used in the resolution) and the geometric method that uses the geometry of the configuration itself. We show that the ballooning stability does not depend on the method of the parallel current calculation. In contrast, the value of Mercier criterion depends sensitively on which method is used. Not only is the geometric method not sensitive to resonant surfaces (in particular, the i_p = 1/6), but there is a systematic error in the Mercier criterion for nonresonant surfaces when not enough modes are used to calculate the equilibria numerically with a spectral method. However,

this systematic error does not change the average beta limit of W 7-X because ballooning stability is more stringent than Mercier stability for this configuration. (author) 8 figs., 13 refs.

14059 (LRP–486/93) **Study of wave-particle interaction from the linear regime to dynamical chaos in a magnetized plasma.** Fasoli, A. (Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP)). Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP). Oct 1993. 197p. Order Number DE94617191. Source: OSTI; NTIS; INIS.

Deterministic chaos generated by the interaction between charged particles and electrostatic plasma waves has been observed in a linear magnetized plasma. The target plasma is created by a barium Q-source, guaranteeing low fluctuation levels and a high degree of uniformity over an extended plasma volume. Characteristics of the background plasma are investigated by a variety of diagnostic techniques, including laser induced fluorescence (LIF) and optical tagging (OT). Particular tagging schemes and specific theoretical approaches to data interpretation (both for LIF and OT) have been developed during this work. As part of these background plasma studies, special attention has been devoted to an investigation of test-ion cross-field transport under different conditions. Test-ions are created and followed in their motion across the magnetic field lines via spin state tagging. In the unperturbed plasma this motion is found to be a diffusive process, supported by classical mechanisms, even in the presence of relatively high pressures of non-reactive neutral gases injected into the plasma volume. Electrostatic waves are excited using a ring antenna structure encircling the plasma column and electrically isolated from it. This system has been chosen on the basis of a comparative analysis of different ion wave launching methods, including the use of grids, inductive coils coupled electromagnetically to the plasma and modulated high frequency electron waves. Two modes propagating parallel to the magnetic field, one of which has two perpendicular components (ion Bernstein and ion acoustic-like waves), characterize the spectrum excited by the electrostatic ring antenna for a single frequency, f, chosen in the range $f_{ci}<f<2f_{ci}$. (author) figs., tabs., 134 refs.

14060 (NIFS–219) **Self-sustained turbulence and L-mode confinement in toroidal plasmas.** Itoh, K. (National Inst. for Fusion Science, Nagoya (Japan)); Itoh, S.; Fukuyama, A.; Yagi, M.; Azumi, M. National Inst. for Fusion Science, Nagoya (Japan). Apr 1993. 114p. Order Number DE94748497. Source: OSTI; NTIS; INIS.

Theory of the L-mode confinement in toroidal plasmas is developed. The quantitative effect of the anomalous transport, which is caused by microscopic fluctuations, on the pressure-gradient-driven modes is analyzed. The ExB nonlinearity is renormalized in a form of the transport coefficient such as the thermal diffusivity, the ion viscosity and the current diffusivity. The destabilization by the current-diffusivity and the stabilization by the thermal transport and ion viscosity are analyzed. By use of the mean-field approximations, the nonlinear dispersion relation is solved. Growth rate and stability condition are expressed in terms of the renormalized transport coefficients. The transport coefficients in the steady state are obtained by the marginal stability condition for the least stable mode. This method is applied to the microscopic ballooning mode for the toroidal plasma with the magnetic well (such as tokamak). The comparison with experimental observations are made. A good agreement is found in a various aspects of the L-mode plasmas; The typical wavenumber and level of the fluctuations for the self-sustained turbulence is also obtained. The analysis is also made for the plasma with magnetic hill and shear (such as torsatron/ Heliotron devices). This method is applied to the interchange modes. Formula of the anomalous transport is obtained. Also investigated is the case of the magnetic well and low magnetic shear (conventional stellarator). The roles of the pressure gradient and the collisionless skin depth in determining the anomalous transport are found to be generic in toroidal plasmas. The difference in the magnetic configuration affects the transport coefficient. These formula explain major experimental observations. (J.P.N.).

14061 (NIIEFA-P-B–0891) **Numerical simulation of nonsymmetric divertor plasma configuration at the presence of ferromagnetic.** Bondarchuk, Eh.N.; Dojnikov, N.I.; Obidenko, T.P. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1991. 9p. (In Russian). Order Number DE94617114. Source: OSTI; NTIS (US Sales Only); INIS.

Two-dimensional problem of MHD-equilibrium of monozero divertor plasma configuration is solved on the base of numerical simulation at the presence of a ferromagnetic with an arbitrary saturation degree. Dependence of currents in the system of the facility poloidal field system on the B_J value growth is investigated. 12 refs., 5 figs.

14062 (NIIEFA-P-B–0896) **Simulating physical scenarios for the TEXTOR tokamak.** Kokotkov, V.V. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1991. 9p. (In Russian). Order Number DE94617116. Source: OSTI; NTIS (US Sales Only); INIS.

Physical scenarios for the Textor reconstructed tokamak are presented. The main aim of poloidal system modification is increasing the plasma current up to 800 kA and prolongation of the discharge platean up to 9-10 s at the total pulse duration of 12 s.

14063 (ORNL/FTR–4848) **Travel to Japan to attend and present a paper at the Fifth Toki Conference on Plasma Physics and Controlled Nuclear Fusion: Foreign trip report, November 14–20, 1993.** Batchelor, D.B. Oak Ridge National Lab., TN (United States). 6 Dec 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94004463. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The traveler attended the Fifth Toki Conference on Plasma Physics and controlled Nuclear Fusion in Toki City, Japan from November 16–19, 1993. He gave an oral presentation entitled "Recent Results on Modeling of Fast Wave Current Drive and FWCD Antennas."

14064 (PPPL–2960) **Lower Hybrid Current Drive and ion Bernstein wave heating experiments on PBX-M.** Bernabei, S. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94007662. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an overview of the experiments conducted on PBX-M to control on evaluate the feasibility and effect of current profile and pressure profile control on the plasma stability. Utilizing the inaccessibility of the Lower Hybrid waves, it has been possible to obtain a certain degree of power deposition localization and off-axis current drive. The effect of fast electron diffusion has been studied and found not to be a limiting factor; consequently, the current profile has been modified in a non-transient manner. More serious is the destabilization of global MHD modes, due to the change of the current profile, which can lead to disruption or to a rapid radial redistribution of the fast electron population. Experiments with Ion Bernstein wave heating have shown that power can be deposited off-aids and that the ion temperature can be modified locally. Application of IBW into a strongly Neutral Beam (NBI) heated H-mode plasma causes a substantial increase of thermal and particle confinement in the core of the plasma: this produces a localized bootstrap current sufficient to significantly raise the value of q(O). We propose to refer to this condition as the CH-mode.

14065 (PPPL–2961) **Periods of enhanced transport during H-mode in PBX-M.** Sesnic, S. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Kaita, R.; Kaye, S.M.; Okabayashi, M.; Dunlap, J. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94007661. Source: OSTI; NTIS; INIS; GPO Dep.

In PBX-M, periods of enhanced transport are often observed in high β_{pol} H-mode discharges. They can reduce the energy confinement time by a factor of two. Their duration is typically between 2 to 20 ms. They are followed by periods of normal transport of a similar duration. These periods of enhanced transport consist of a series of turbulent m = even MHD events, starting several cm inside the plasma edge. They propagate into the confinement region in 600 μs, causing a progressive erosion of the profile. Each m = even event can also cause an energy loss of 1% or less, mainly

from the confinement region. These m = even events are reminiscent of grassy ELMS.

14066 (PPPL–2962) **Performance of the PBX-M passive plate stabilization system.** Kugel, H.W. (and others); Bell, R.; Bernabei, S. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94007660. Source: OSTI; NTIS; INIS; GPO Dep.

The PBX-M passive plate stabilization system provides significant stabilization of long-wavelength external kink modes, the slowing of vertical instability growth rates, and the amelioration of disruption characteristics. The passive plate stabilization system has allowed the use of LHCD and IBW to induce current density and pressure profile modifications, and m = 1 divertor biasing for modifying edge plasma transport. Improvements in the passive plate system insulators and support structures have provided reliable operation. Impurity influxes with the close-fitting passive plates are low. Solid target boronization is applied routinely to reduce conditioning time and maintain clean conditions.

14067 (PPPL–2970) **Frequency-sweeping: A new technique for energy-selective transport.** Mynick, H.E.; Pomphrey, N. Princeton Univ., NJ (United States). Plasma Physics Lab. Feb 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE94007659. Source: OSTI; NTIS; INIS; GPO Dep.

A new method is described for inducing energy-selective transport by 'sweeping' the frequency of applied low-n magnetic perturbations. The mechanism, formally analogous to the 'rising buckets' concept in accelerator physics, can move particles with a selected velocity in a nondiffusive fashion from one specified radius to another. The technique is considered principally as a means for removal of Helium ash. Other likely applications are as a method for burn control, profile control, as a diagnostic, and perhaps as a nonstochastic means of effecting the direct coupling of alpha power recently discussed by Fisch and Rax.

14068 (UCRL-ID–115962) **The Numerical Tokamak Project (NTP) simulation of turbulent transport in the core plasma: A grand challenge in plasma physics.** Lawrence Livermore National Lab., CA (United States). Dec 1993. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008279. Source: OSTI; NTIS; INIS; GPO Dep.

The long-range goal of the Numerical Tokamak Project (NTP) is the reliable prediction of tokamak performance using physics-based numerical tools describing tokamak physics. The NTP is accomplishing the development of the most advanced particle and extended fluid model's on massively parallel processing (MPP) environments as part of a multi-institutional, multi-disciplinary numerical study of tokamak core fluctuations. The NTP is a continuing focus of the Office of Fusion Energy's theory and computation program. Near-term HPCC work concentrates on developing a predictive numerical description of the core plasma transport in tokamaks driven by low-frequency collective fluctuations. This work addresses one of the greatest intellectual challenges to our understanding of the physics of tokamak performance and needs the most advanced computational resources to progress. We are conducting detailed comparisons of kinetic and fluid numerical models of tokamak turbulence. These comparisons are stimulating the improvement of each and the development of hybrid models which embody aspects of both. The combination of emerging massively parallel processing hardware and algorithmic improvements will result in an estimated 10**2–10**6 performance increase. Development of information processing and visualization tools is accelerating our comparison of computational models to one another, to experimental data, and to analytical theory, providing a bootstrap effect in our understanding of the target physics. The measure of success is the degree to which the experimentally observed scaling of fluctuation-driven transport may be predicted numerically. The NTP is advancing the HPCC Initiative through its state-of-the-art computational work. We are pushing the capability of high performance computing through our efforts which are strongly leveraged by OFE support.

14069 (UCRL-ID–116271) **First-wall heat-flux measurements during ELMing H-mode plasma.** Lasnier, C.J. (Lawrence Livermore National Lab., CA (United States)); Allen, S.L.; Hill, D.N.; Leonard, A.W.; Petrie, T.W. Lawrence Livermore National Lab., CA (United States); General Atomics, San Diego, CA (United States). 28 Jan 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC03-84ER51044. Order Number DE94008310. Source: OSTI; NTIS; INIS; GPO Dep.

In this report we present measurements of the diverter heat flux in DIII-D for ELMing H-mode and radiative diverter conditions. In previous work we have examined heat flux profiles in lower single-null diverted plasmas and measured the scaling of the peak heat flux with plasma current and beam power. One problem with those results was our lack of good power accounting. This situation has been improved to better than 80–90% accountability with the installation of new bolometer arrays, and the operation of the entire complement of 5 Infrared (IR) TV cameras using the DAPS (Digitizing Automated Processing System) video processing system for rapid inter-shot data analysis. We also have expanded the scope of our measurements to include a wider variety of plasma shapes (e.g., double-null diverters (DND), long and short single-null diverters (SND), and inside-limited plasmas), as well as more diverse discharge conditions. Double-null discharges are of particular interest because that shape has proven to yield the highest confinement (VH-mode) and beta of all DIII-D plasmas, so any future diverter modifications for DIII-D will have to support DND operation. In addition, the proposed TPX tokamak is being designed for double-null operation, and information on the magnitude and distribution of diverter heat flux is needed to support the engineering effort on that project. So far, we have measured the DND power sharing at the target plates and made preliminary tests of heat flux reduction by gas injection.

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Refer also to citation(s) 11622, 11893, 12231, 12790, 12791, 12894, 13948, 13950, 13954, 13956, 13960, 13978, 13981, 14056, 14063, 14066, 14067, 14069

14070 (ANL/FPP/TM–263) **ITER solid breeder blanket materials database.** Billone, M.C. (Argonne National Lab., IL (United States)); Dienst, W.; Flament, T.; Lorenzetto, P.; Noda, K.; Roux, N. Argonne National Lab., IL (United States). Nov 1993. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008315. Source: OSTI; NTIS; INIS; GPO Dep.

The databases for solid breeder ceramics (Li_2O, Li_4SiO_4, Li_2ZrO_3 and $LiAlO_2$) and beryllium multiplier material are critically reviewed and evaluated. Emphasis is placed on physical, thermal, mechanical, chemical stability/compatibility, tritium, and radiation stability properties which are needed to assess the performance of these materials in a fusion reactor environment. Correlations are selected for design analysis and compared to the database. Areas for future research and development in blanket materials technology are highlighted and prioritized.

14071 (DOE/ER–0313/14, pp. 3-13) **Preparation of COBRA 1A for insertion into EBR-II.** Hamilton, M.L. (Pacific Northwest Laboratory, Richland, WA (United States)); Ermi, R.M.; Eiholzer, C.R. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

COBRA 1 A was built to support the research and development efforts of the U.S. DOE Neutron Interactive Materials (NIMs) program and the Japanese university fusion materials program. COBRA was inserted into the EBR-II for irradiation beginning in run 162. The specimen loading is documented here.

14072 (DOE/ER–0313/14, pp. 14-40) **Fabrication and operation of HFIR-MFE RB* spectrally tailored irradiation capsules.** Longest, A.W. (Oak Ridge National Laboratory, TN (United States)); Pawel, J.E.; Heatherly, D.W.; Sitterson, R.G.; Wallace, R.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period*

ending March 31, 1993. 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Fabrication and operation of four HFIR-MFE RB* capsules (60, 200, 330, and 400°C) to accommodate MFE specimens previously irradiated in spectrally tailored experiments in the ORR are proceeding satisfactorily. With the exception of the 60°C capsule, where the test specimens were in direct contact with the reactor cooling water, specimen temperatures (monitored by 21 thermocouples) are controlled by varying the thermal conductance of a thin gap region between the specimen holder outer sleeve and containment tube. Irradiation of the 60 and 330°C capsules, which started on July 17, 1990, was completed on November 14, 1992, after 24 cycles of irradiation to an incremental damage level of approximately 10.9 displacements per atom (dpa). Assembly of the follow-up 200 and 400°C capsules was completed in November 1992, and their planned 20-cycle irradiation to approximately 9.1 incremental dpa was started on November 21, 1992. As of February 11, 1993, the 200 and 400°C capsules had successfully completed three cycles of irradiation to approximately 1.4 incremental dpa.

14073 (DOE/ER–0313/14, pp. 41-43) **Status of US/Japan collaborative program phase II HFIR target capsules.** Pawel, J.E. (Oak Ridge National Laboratory, TN (United States)); Senn, R.L.; Shiba, K. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

A complete description and details of the design, construction, and installation of capsules JP9 through JP16 have been previously reported. The capsules were installed in the High Flux Isotope Reactor (HFIR) target July 20, 1990 for irradiation beginning with HFIR fuel cycle 289. The capsules were removed and stored in the reactor pool during HFIR cycle 293 (12/27/90 - 1/23/91) to provide room for required isotope production. They were reinstalled for HFIR cycle 294 for continued irradiation. Of these eight target capsules, JP10, 11, 13, and 16 completed their scheduled number of cycles (11) and were removed from the reactor in September 1991. In addition, JP14 was removed from the reactor at the end of cycle 310 (9/18/92) after 21 cycles. Three new capsules in this series, JP20, 21, and 22, have been designed. These capsules were added to the program in order to complete the experimental matrix included in the JP9 through JP16 capsules. The new capsules will contain transmission electron microscope (TEM) disks and SS-3 flat tensile specimens at 300-600°C and will achieve doses of 8, 19 and 35 dpa, respectively. The preliminary experiment matrix is described in detail in a previous report.

14074 (DOE/ER–0313/14, pp. 47-50) **Helium measurements for the MOTA 1G discharge of the ^{59}Ni isotopic tailoring experiment.** Garner, F.A. (Pacific National Laboratory, Richland, WA (United States)); Oliver, B.M. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The final measurements of helium generation in specimens used in the ^{59}Ni isotopic tailoring experiment have been completed. The results show that the target generation rates were sustained throughout the experimental series. It was also demonstrated that helium generation rates grow continuously in undoped specimens, reaching levels substantially larger than usually quoted in most other studies.

14075 (DOE/ER–0313/14, pp. 51-54) **Neutron dosimetry for the MOTA-1G experiment in FFTF.** Greenwood, L.R. (Pacific Northwest Laboratory, Richland, WA (United States)); Kellogg, L.S. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Neutron fluence and spectral measurements and radiation damage calculations are reported for the MOTA-1G experiment in the Fast Flux Test Facility (FFTF). The irradiation was conducted from January 4, 1990, to March 19, 1991, for a total exposure of 299.7 EFPD. The maximum fluence was 15.8 x 10^{22} n/cm^2, 10.0 x 10^{22} above 0.1 MeV producing 43.0 dpa in iron. Neutron fluence and radiation damage maps are presented for the entire MOTA assembly based on the analysis of ten spectral measurements and seven additional flux gradient measurements.

14076 (DOE/ER–0313/14, pp. 55-56) **Measurement of helium generated in V-B alloys irradiated in FFTF/MOTA.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Oliver, B.M.; Sekimura, N. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

V-B and V-5Cr-B alloys have been irradiated in FFTF to assess the impact of helium generation rate on microstructural evolution of vanadium-base alloys. Using this method it is somewhat difficult to separate the various effects of the original boron as well as the lithium and helium products of the ^{10}B (n, α) reaction. Post-irradiation measurements of helium concentrations have been completed for two sets of V-B alloys, one irradiated in-core and one below core. It appears that the boron doping technique used to produce the various alloys was reasonably successful in reaching the desired helium/dpa variations.

14077 (DOE/ER–0313/14, pp. 57-70) **New activation cross section data.** Mann, F.M. (Westinghouse Hanford Company, Richland, WA (United States)); Lessor, D.E. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

New nuclear cross section libraries (known as USACT92) have been created for activation calculations. A point-wise file was created from merging the previous version of the activation library, the U.S. Nuclear Data Library (ENDF/B-VI), and the European Activation File (EAF-2). 175 and 99 multi-group versions were also created. All the data are available at the National Energy Research Supercomputer Center.

14078 (DOE/ER–0313/14, pp. 71-73) **Transmutation of tungsten in FFTF, HFIR and starfire.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Greenwood, L.R. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Tungsten has been used in a variety of low activation ferritic alloys and also in copper composite alloys, both currently being irradiated in various fusion materials experiments. It has been proposed as an armor material also. Tungsten transmutes strongly to rhenium and then osmium, however, in a manner that is strongly dependent on neutron spectra. This adds significant complexity to the interpretation of data developed in one spectral environmental but intended for application to another environment.

14079 (DOE/ER–0313/14, pp. 74-78) **Summary of ionizing and displacive irradiation fields in various facilities.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)); Greenwood, L.R. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Calculations have been performed to estimate the ionizing and displacive irradiation fields that will occur in ceramics during irradiation in accelerators and fission and fusion reactors. A useful measure of the relative strength of ionizing vs. displasive radiation is the ratio of the absorbed ionizing dose to the displacement damage dose, which in the case of ion irradiation is equal to the ratio of the electronic stopping power to the nuclear stopping power. In ceramics such as Al_2O_3, this ratio is about 20 at a fusion reactor first wall, and has a typical value of about 100 in a fusion reactor blanket region and in mixed spectrum reactors such as HFIR. Particle accelerator sources typically have much higher ionizing to displacive radiation ratios, ranging from about 2000 for 1 MeV protons to >10,000 for 1 MeV electrons.

14080 (DOE/ER–0313/14, pp. 79-84) **Improvement of decay and cross-section data libraries for activation calculations.** Attaya, H. (Argonne National Laboratory, IL (United States)). Oak

Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

A new decay data library has been completed. The new library contains up-to-date decay information (half-lives, branching ratios, decay energies, γ's energies and intensities). Activation responses such as the air and water biological hazard potentials, the waste disposal rating, and the biological dose are also included in this library. Recently developed cross-section libraries have been acquired to be used together with the decay data library.

14081 (DOE/ER–0313/14, pp. 85-90) **Activation analysis for different structural alloys considered for ITER.** Attaya, H. (Argonne National Laboratory, IL (United States)); Smith, D. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Activation calculations have been made for the austentic steel 316SS, the ferritic alloy HT-9, the titanium alloy Ti6A14V, and the vanadium alloy V5Cr5Ti in a liquid metal (Na) design suggested recently for ITER. The calculations show that the vanadium alloy has the minimum short and long-term radioactivity and BHP. It also has the minimum decay heat at all the time. The titanium alloy has less radioactivity than the austenitic and this ferritic alloys. However, the decay heat of this alloy could exceed that of the conventional alloys.

14082 (DOE/ER–0313/14, pp. 95-103) **Mechanical properties along interfaces of bonded structures in fusion reactors.** Hassan, M.H. (Univ. of Wisconsin, Madison, WI (United States)); Kulcinski, G.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Proper assessment of the mechanical properties along interfaces of bonded structures currently used in many fusion reactor designs is essential to compare the different fabrication techniques. A Mechanical Properties Microprobe (MPM) was used to measure hardness and Young's modules along the interfaces of Be/Cu bonded structure. The MPM was able to distinguish different fabrication techniques by a direct measurement of the hardness, Young's modules, and H/E^2 which reflects the ability of deformation of the interfacial region.

14083 (DOE/ER–0313/14, pp. 104-122) **Green's function methodology for fracture mechanics of SIC-SIC composite structures.** El-Azab, A. (Univ. of California, Los Angeles, CA (United States)); Ghoniem, N.M. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

A fundamental solution of plane elasticity in a finite domain is developed in this paper. A closed-form Green's function for the elastic field of an edge dislocation of arbitrary Burger's vector at an arbitrary point in an orthotropic finite elastic domain, that is free of traction, is presented. The method is based on the classical theory of potential fields, with an additional distribution of surface dislocations to satisfy the free traction boundary condition. A solution is first developed for a dislocation from the original dislocation, and a regular component associated with the surface distribution. The Schwarz-Christoffel transformation is then utilized to map the field quantities to a finite, polygonal domain. A closed form solution containing Jacobi elliptic functions is developed for rectangular domains, and applications of the method to problems of fracture and plasticity are emphasized.

14084 (DOE/ER–0313/14, pp. 125-126) **Factors which control the swelling of Fe-Cr-Ni ternary austenitic alloys.** Garner, F.A. (Pacific National Laboratory, Richland, WA (United States)); Edwards, D.J. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

In agreement with limited earlier studies, a comprehensive irradiation experiment conducted in EBR-II demonstrates that while cold-working decreases swelling of Fe-15Cr-XNi (X=12-45 wt%) alloys at relatively low irradiation temperatures, it increases swelling at higher temperatures. Aging of cold-worked specimens to produce polygonized dislocation networks tends to further increase swelling, especially at higher nickel (>25%) levels. Swelling at lower nickel levels also appears to be sensitive to details of the annealing treatment.

14085 (DOE/ER–0313/14, pp. 127-128) **The influence of cold work level on swelling of pure copper irradiated by fast neutrons or electrons.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Singh, B.N. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Pure copper has been irradiated in a variety of starting conditions by either 1.0 MeV electrons or fast neutrons in FFTF-MOTA. Electron irradiation at 250 and 350°C produces a non-monotonic swelling behavior as a function of cold work level, increasing swelling at lower cold-work levels and decreasing swelling at higher cold-work levels. In FFTF at 365 and 430°C, however, 10% cold-work reduces swelling initially, with little additional influence at higher cold-work levels. Swelling at 520 and 600°C is less than 1% at 35.9 and 13.6 dpa, respectively, with little effect of cold work level.

14086 (DOE/ER–0313/14, pp. 129-140) **The influence of details of reactor history on microstructural development during neutron irradiation.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Sekimura, N.; Grossbeck, M.L.; Ermi, A.M.; Newkirk, J.W.; Watanabe, H.; Kiritani, M. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Microstructurally-oriented irradiation experiments are shown in this paper to be strongly dependent on details of reactor history that frequently are not brought to the experimenter's attention. In some cases, these details can dominate the experiment so as to produce very misleading results. To aid in the design and interpretation of microstructurally-oriented experiments, a number of studies are reviewed to highlight history effects and then guidelines are presented to minimize the impact of reactor history in new experiments.

14087 (DOE/ER–0313/14, pp. 141-144) **Neutron-induced swelling of pure nickel and nickel binary alloys.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The second and last phase of the EBR-II AA-14 experiment confirms many of the trends observed in Phase I of the experiment. Phase I reached 12 to 14 dpa for pure nickel and nickel-binary alloys at 425, 500 and 600°C. Phase II reached 31.1 to 31.8 dpa at the same temperatures. Annealed nickel exhibits a strongly temperature-dependent tendency toward saturation of void swelling. This tendency is reduced by cold-working and thus swelling is increased initially by cold-working, but this does not preclude attainment of saturation. Ni-5A1 in the annealed condition continues to swell in the 12-31 dpa interval, but swelling is suppressed somewhat by cold-working. Aging of the cold-worked material tends to restore the swelling to levels near that of the annealed alloy. The suppression in swelling observed in Ni-5Si and Ni-8Si at 12-14 dpa is preserved to ~31 dpa.

14088 (DOE/ER–0313/14, pp. 145-149) **Defect production in irradiated metals.** Heinisch, H.L. (Pacific Northwest Laboratory, Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period*

ending March 31, 1993. 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Present knowledge of the processes involved in creating defects during cascade-producing irradiations is reviewed. Molecular dynamics simulations within the past few years have led to an understanding of the creation and survival of point defects in the critical first picoseconds of the cascade process, through the quenching of the thermal spike. The concept that 'freely migrating defects' arise only from isolated Frenkel pairs produced in a cascade is critically discussed.

14089 (DOE/ER–0313/14, pp. 150-162) **Molecular dynamics calculations of defect energetics in β-SiC.** Huang, H. (Univ. of California, Los Angeles, CA (United States)); El-Azab, A.; Ghoniem, N. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract FG03-91ER54115. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The Molecular Dynamics (MD) method is used to calculate defect energetics in β-silicon carbide. Many-body interaction effects in this covalent material are accounted for by using a hybrid of two-body and three-body potentials. Calculated bulk properties of β-SiC based on this potential are in agreement with experimental data to within 17%. A micro-crystal is constructed to represent the computational cell and external forces are applied to the micro-crystal so that it behaves as a part of an infinite medium. The potential energy for the unperturbed computational cell is first calculated. The cell is then set at a defect configuration and relaxed, and the potential energy of the relaxed cell is calculated. The difference between the potential energy of the unperturbed cell and that of the defect-containing cell is used to calculate the formation and binding energies of point defects, defect clusters and helium-vacancy clusters in SiC.

14090 (DOE/ER–0313/14, pp. 165-170) **Effects of hydrogen and loading mode on the fracture toughness of a reduced activation ferritic stainless steel.** Li, H. (Washington State Univ., Spokane, WA (United States)); Hirth, J.P.; Jones, R.H.; Gelles, D.S. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The full spectrum of fracture toughness (J integrals), including pure mode I, different mixed mode I/III and pure mode III, will be examined for a ferritic/martensitic stainless steel with 0.1C-8Cr-2W-0.2V-0.04Ta-Fe (by wt%), designated as F-82H. The J integrals of pure mode I (J_{Ic}) and mixed mode I/III (J_{mixed}) are determined with single specimen method using standard compact tension specimens and modified compact tension specimens, respectively. The pure mode III integral is measured with multiple specimen method using 'triple-pantleg' specimens. The pure mode III integral is measured with multiple specimen method using 'triple-pantleg' specimens. Effects of hydrogen on the J integrals of pure mode I and mixed mode I/III are also going to be studied. 9 ppm H (about 500 appm) is pre-charged into specimens cathodically. The details of experimental procedure were described in this report. The preliminary results showed that addition of mode III stress (shear stress) to mode I loading had a significant negative effect on the fracture toughness of F-82H. The complete results, analysis and conclusion will be reported in next report. The results would be important to fusion reactor design.

14091 (DOE/ER–0313/14, pp. 171-173) **Irradiation creep and swelling of the fusion heats of HT9 and 9Cr-1Mo to 208 DPA at ~400°C.** Garner, F.A. (Pacific Northwest Laboratory, Richlnad, WA (United States)); Toloczko, M.B.; Eiholzer, C.R. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The irradiation creep behavior of the fusion heats of HT9 and 9Cr-1Mo at ~400°C has been measured to exposures as large as 208 dpa. HT9 is somewhat nonlinear in its response to hoop stress level in the range 0-200 MPa, but 9Cr-1Mo exhibits only slightly greater than linear behavior with stress level. The strain data of both alloys appear to include some contributions from precipitate-related density changes. Swelling may have occurred in 9Cr-1Mo.

14092 (DOE/ER–0313/14, pp. 174-188) **Effect of vanadium and titanium on mechanical properties of low-chromium, reduced-activation ferritic steels.** Klueh, R.L.; Alexander, D.J. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Tensile and Charpy impact tests were made on three normalized-and-temperated 2 1/4Cr-2WV (0.1% C) steels with 0.1, 0.25, and 0.5% V (all concentrations are in weight percent). Increasing vanadium from 0.1 to 0.25% increased the yield stress up to twenty percent. A higher ductile-brittle transition temperature (DBTT) accompanied the higher strength of the 0.25% V steel when both were tempered at 700°C. Tempering at 750°C gave similar DBTTs. Increasing vanadium from 0.25 to 0.5% caused a slight increase in strength with a large decrease in toughness. Thus, a balance between strength and impact toughness is achieved with an intermediate vanadium concentration. Addition of 0.02% Ti to 2 1/4Cr-0.25 V, 2 1/4Cr-2W, and 2 1/4Cr-2W-0.25V (0.1% C) steels caused a yield stress decrease of 10 to 30%, which was attributed to the effect of titanium on the MC precipitate distribution. The strength loss was accompanied by an increase in impact toughness, which may also have been affected by a decrease in prior austenite grain size. Furthermore, there was little difference in the DBTT of the Ti-modified steels tempered at 700 or 750°C. if it were possible to use a Ti-modified steel tempered at 700°C, this might offset the strength advantage of steels without titanium, which have to be tempered at the higher temperature.

14093 (DOE/ER–0313/14, pp. 191-199) **Stress-modeled welding process for helium-bearing type 316 stainless steels.** Wang, C.A. (Auburn Univ., AL (United States)); Chin, B.A.; Grossbeck, M.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Experiments have shown that Type 316 stainless steel is susceptible to heat-affected-zone (HAZ) cracking upon cooling when welded using the gas tungsten arc (GTA) process under lateral constraint. The cracking has been hypothesized to be caused by stress-assisted helium bubble growth and rupture at grain boundaries. This study utilized an experimental welding setup which enabled different compressive stresses to be applied to the plates during welding. Autogenous GTA welds were produced in Type 316 stainless steel doped with 256 appm helium. The application of a compressive stress, 55 MPa, during welding suppressed the previously observed catastrophic cracking. Detailed examinations conducted after welding showed a dramatic change in helium bubble morphology. Grain boundary bubble growth along directions parallel to the weld was suppressed. The results suggest that stress-modified welding techniques may be used to suppress or eliminate helium-induced cracking during joining of irradiated materials.

14094 (DOE/ER–0313/14, pp. 200-204) **Relationship between swelling and irradiation creep in cold worked PCA stainless steel to 178 DPA at~400°C.** Toloczko, M.B. (Univ. of California, Santa Barbara, CA (United States)); Garner, F.A. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

At 178 dpa and ~400°C, the irradiation creep behavior of 20% cold-worked PCA has become dominated by the creep disappearance phenomenon. The total diametral deformation rate has reached the limiting value of 0.33%/dpa at the three highest stress levels. The stress-enhancement of swelling tends to camouflage the onset of creep disappearance, however.

14095 (DOE/ER–0313/14, pp. 205-210) **Density changes observed in pure molybdenum and Mo-41Re after irradiation in FFTF/MOTA.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Greenwood, L.R. Oak Ridge National Lab.,

TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Pure molybdenum and Mo-41wt% Re, in both the 20% cold-worked and aged and the annealed and aged conditions, were irradiated in FFTF/MOTA to exposures as high as 111 dpa. Pure molybdenum appears to approach a saturation swelling level that is independent of the starting state. Cold-worked and aged molybdenum initially swells at a higher rate than that of solution annealed and aged molybdenum and overshoots the saturation level at lower irradiation temperatures. This requires that part of the accumulated swelling be removed to approach saturation, probably by void shrinkage. The alloy Mo-41Re exhibits a more complex behavior with the annealed and aged condition initially swelling faster, but eventually the density change of both conditions begins to turn downward and tends toward densification. The role of solid transmutation to Tc, Re, and Os is though to be very important in the irradiation behavior of these two metals. Calculations of transmutant generation are provided for FFTF, HFIR and STARFIRE spectra.

14096 (DOE/ER–0313/14, pp. 211-215) **Irradiation creep of Russian Federation Pressurized tubes in MOTA-2B.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Eiholzer, C.R.; Demina, E.V.; Ivanov, L.I. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Irradiation has been completed in MOTA-2B for creep tubes constructed from a candidate reduced activation austenitic alloy supplied by the Baikov Institute in Moscow. The total strains are strongly dependent on irradiation temperature in the range 425-600°C, but are not completely linear with stress level.

14097 (DOE/ER–0313/14, pp. 216-217) **Density measurements performed on Ispra second generation AMCR alloys irradiated in MOTA-2A.** Garner, F.A.; Schiller, P.; Takahashi, H. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Density change measurements have been completed on the Ispra second generation AMCR alloys irradiated in MOTA-2A. The various compositional modifications induce a wide variation of swelling behavior in the range 423-600°C at 32-36 dpa.

14098 (DOE/ER–0313/14, pp. 218-232) **Thermal stability of manganese-stabilized stainless steels.** Klueh, R.L.; Kenik, E.A. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Previous work on a series of experimental high-manganese reduced-activation austenitic stainless steels demonstrated that they have improved tensile properties relative to type 316 stainless steel in both the annealed and 20% cold-worked conditions. Steels were tested with an Fe-20Mn-12Cr-0.25C (in weight percent) base composition, to which various combinations of Ti, W, V, P, and B were added. Tensile tests have now been completed on these steels after thermal aging at 600°C. Thermal stability varied with composition, but the alloys were as stable or more stable than type 316 stainless steel. the strength of the annealed steels increased slightly after aging to 5000 h, while a strength decrease occurred for the cold worked steel. In both conditions, a steel containing a combination of all the alloying elements was most stable and had the best strength after thermal aging 5000 h at 600°C. Despite having much higher strength than 316 stainless steel after aging, the ductility of the strongest experimental alloy was still as good as that of 316 stainless steel.

14099 (DOE/ER–0313/14, pp. 233-240) **Comparison of microstructural evolution in reactor-irradiated austenitic stainless steels with and without spectrally tailoring.** Jitsukawa, S. (Japan Atomic Energy Research Institute, Tokai-mura (Japan)); Sawai, T.; Shiba, K.; Hamada, S.; Hishinuma, A. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The effects of He-dpa ratio on swelling behavior were examined on three austenitic stainless steels. Materials were solution-annealed JPCA and two low carbon containing alloys (C and K) modified with titanium and niobium. These steels were neutron-irradiated in ORR and HFIR with and without spectrally tailoring, respectively. Achieved damage level was 7.4 dpa in ORR irradiation with average He/dpa of about 21 appm/dpa. In case of HFITR irradiation, they were 33 dpa and 76 appm/dpa, respectively. Alloy to alloy variation and temperature dependence of swelling behavior are far more distinctively detected in ORR irradiation than in HFIR irradiation, in spite of the lower damage level of ORR irradiation. In the case of ORR-irradiation, JPCA exhibited small swelling values of <0.01 and 0.03 % at 603 and 673 K, respectively, while a low carbon alloy K showed relatively larger swelling; 0.2 % at 603 K and 0.6 % at 673 K. Swelling of JPCA and K irradiated in HFIR were almost same values of 0.2% at temperatures of 573 and 673 K. Number densities of cavities in HFIR-irradiated alloys were larger than those observed in ORR by one to two orders. On the other hand, number densities and sizes of dislocation loops produced by ORR irradiation were two to five times as large as those by HFIR irradiation. These facts suggest that in ORR condition with closer He/dpa to that of fusion, mutual annihilation rate of point defects was reduced and then bias driven cavity growth might be enhanced compared with HFIR condition.

14100 (DOE/ER–0313/14, pp. 241-250) **Microstructures of a welded joint using an irradiated wrapper tube.** Hamada, S. (Japan Atomic Energy Research Institute, Tokai-mura (Japan)); Watanabe, K.; Hishinuma, A.; Takahashi, I.; Kikuchi, T. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The behavior of helium in welded joint fabricated using tungsten inert gas (TIG) welding process for a type 316 stainless steel wrapper tube irradiated in a fast reactor was investigated. The wrapper tube was irradiated to (1.5 - 4.2) x 10^{26} n/m^2 (helium level of 3 to 9 appm) at 395 - 410°C. All welded joints fractured in the heat-affected zone (HAZ). The microstructures of each portion of the base metal, the HAZ and the fusion zone in a welded joint were examined through a transmission electron microscope. Small helium bubbles were observed in number density of 2 x 10^{20} m^{-3} in the matrix and rarely found on the grain boundaries of the base metal. In the HAZ, small and large helium bubbles mixed and lined up along the grain boundaries. In particular, some of them elongated along the grain boundary. In the matrix of the fusion zone, delta-ferrite phases and unresolved carbides were scattered. Large cavities were attached to these precipitates and also occurred along grain boundaries. These results suggest that the failure in the HAZ of welded joints is attributed to the preferential growth and coalescence of helium bubbles in the grain boundaries of the HAZ caused by weld heat input and stress during welding.

14101 (DOE/ER–0313/14, pp. 251-276) **Dose dependence of the microstructural evolution in neutron-irradiated austenitic stainless steel.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)); Maziasz, P.J.; Stoller, R.E. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Microstructural data on the evolution of the dislocation loop, cavity, and precipitate populations in neutron-irradiated austenitic stainless steels are reviewed in order to estimate the displacement damage levels needed to achieve the 'steady state' condition. The microstructural data can be conveniently divided into two temperature regimes. In the low temperature regime (below about 200°C) the microstructure of austenitic stainless steel is dominated by 'black spot' defect clusters and faulted interstitial dislocation loops. The dose needed to approach saturation of the loop and defect cluster densities is generally on the order of 1 displacement per atom (dpa) in this regime. In the high temperature regime (~300 to 700°C), cavities, precipitates, loops and network dislocations are all

produced during irradiation; doses in excess of 10 dpa are generally required to approach a 'steady state' microstructural condition. Due to complex interactions between the various microstructural components that form during irradiation, a secondary transient regime is typically observed in commercial stainless steels during irradiation at elevated temperatures. This slowly evolving secondary transient may extend to damage levels in excess of 50 dpa in typical 300-series stainless steels, and to >100 dpa in radiation-resistant developmental steels. The detailed evolution of any given microstructural component in the high-temperature regime is sensitive to slight variations in numerous experimental variables, including heat-to-heat composition changes and neutron spectrum.

14102 (DOE/ER–0313/14, pp. 277-285) **Fracture toughness of irradiated candidate materials for ITER first wall/blanket structures: Preliminary results.** Alexander, D.J. (Oak Ridge National Laboratory, TN (United States)); Pawel, J.E.; Grossbeck, M.L.; Rowcliffe, A.F. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Candidate materials for first wall/blanket structures in ITER have been irradiated to damage levels of about 3 dpa at temperatures of either 60 or 250°C. Preliminary results have been obtained for several of these materials irradiated at 60°C. The results show that irradiation at this temperature reduces the fracture toughness of austenitic stainless steels, but the toughness remains quite high. The unloading compliance technique developed for the subsize disk compact specimens works quite well, particularly for materials with lower toughness. Specimens of materials with very high toughness deform excessively, and this results in experimental difficulties.

14103 (DOE/ER–0313/14, pp. 289-290) **Density changes induced by neutron irradiation in dynamically compacted tungsten and PCA.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Megusar, J. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Dynamically compacted tungsten with a starting density of 95.3% of the theoretical value densified 2 to 3% when irradiated in FFTF/MOTA-2A at three temperatures between 423 and 600°C and displacement levels corresponding to 32 and 36 dpa in stainless steel. Rapidly solidified and dynamically compacted PCA with high levels of titanium and carbon were also irradiated at these conditions. The density changes were small enough to determine that significant swelling had not occurred but, microscopy is necessary to determine whether void growth occurred in addition to precipitate-related strains.

14104 (DOE/ER–0313/14, pp. 291-293) **Density changes observed in Nb-1Zr after irradiation in FFTF-MOTA.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Nb-1Zr has been proposed for potential application to ITER. Whereas previous irradiation studies on Nb-1Zr were focused on the annealed condition, this study involved a comparative irradiation of both the annealed and aged, and the cold-worked and aged conditions. Based on measurements of density change, the cold-worked and aged condition appears to first undergo a phase-related dilation prior to the onset of void-swelling, while the annealed condition densifies prior to swelling and in some cases does not swell at all.

14105 (DOE/ER–0313/14, pp. 294-298) **Assessment of niobium-base alloys for structural applications in the ITER divertor.** Purdy, I.M. (Argonne National Laboratory, IL (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The corrosion and embrittlement of pure Nb, Nb-1Zr, Nb-5Mo-1Zr, and Nb-5V-1.25Zr (alloy elements in wt.%) were evaluated in high-purity (HP) deoxygenated water at 300°C for up to 120 days. One heat of the Nb-5V-1.1.25Zr alloy ('O' lot) exhibited both a modest corrosion rate and good resistance to embrittlement relative to other Nb-base alloys. At present, Nb-5V-1.25Zr is the most promising Nb-base alloy on the basis of both corrosion and embrittlement characteristics in HP deoxygenated water at 300°C.

14106 (DOE/ER–0313/14, pp. 299-305) **Microstructural evolution induced by boron transmutation in neutron-irradiated vanadium-base alloys.** Chung, H.M. (Argonne National Laboratory, IL (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Microstructural evolution associated with transmutation of ^{10}B to Helium and lithium has been characterized to provide a better understanding of the boron-doping technique, a technique frequently used to simulate the effect of helium generation under fusion reactor conditions. Transmission electron microscopy (TEM) was used to examine specimens of V-20Ti alloy after irradiation at 600°C to ≈44-80 dpa in the Fast Flux Test Facility (FFTF). In the earlier stage of irradiation to low fluence, concentric shells of He-damage and Li-damage zones are produced around a V_3B_2 precipitate or a ^{10}B-rich cluster. On further irradiation, helium atoms diffuse away from the damage shell either to be dissolved in the matrix or to form microcavities, leaving a shell rich in Li, defect clusters, and dislocations. Oxygen atoms in solid solution migrate toward the Li-rich shells, and γ-LiV_2O_5 shells precipitate subsequently. In view of this behavior, neither boron nor Li produced from the transmutation is likely to result in a detrimental weakening of grain boundaries.

14107 (DOE/ER–0313/14, pp. 306-308) **Status of the dynamic helium charging experiment (DHCE).** Tsai, H. (Argonne National Laboratory, IL (United States)); Chung, H.M.; Loomis, B.A.; Smith, D.L.; Matsui, H.; Hamilton, M.L.; Greenwood, L.R.; Ermi, R. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Irradiation of the seven DHCE capsules was completed in the Materials Open Test Assembly (MOTA)-2B at the end of Cycle 12B in the Fast Flux Test Facility (FFTF). The accrued exposure was 203.3 effective full-power days (EFPDs), vis-a-vis the target exposure of 300 EFPDs. Peak damage in the samples was ≈29 displacement per atom (dpa). All seven capsules have been discharged from the FFTF and are being shipped to Argonne National Laboratory (ANL), where the samples will be retrieved from the capsules and distributed to the experimenters, including Monbusho of Japan, for examination and testing. A substantial effort is underway at ANL to retrieve the samples from the highly tritated capsules.

14108 (DOE/ER–0313/14, pp. 309-317) **Thermal creep behavior of V-5Cr-Ti and V-10Cr-5Ti alloys.** Chung, H.M. (Argonne National Laboratory, IL (United States)); Loomis, B.A.; Nowicki, L.J.; Smith, D.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The thermal creep rates and stress-rupture life of V-5Cr-5Ti and V-10Cr-5Ti alloys were determined at 600°C and the impurity composition and microstructural characteristics of creep-tested specimens were analyzed and correlated with the measured creep properties. The results of these tests show that V-5Cr-5Ti, which contains impurity compositions typical of a commercial vanadium-base alloy, exhibits creep strength substantially superior to that of V-20Ti, HT-9, or Type 316 stainless steel. The V-10Cr-5Ti alloy exhibits creep strength somewhat higher than that of V-5Cr-5Ti.

14109 (DOE/ER–0313/14, pp. 318-325) **Ductile-brittle transition temperatures of unirradiated vanadium alloys, based on charpy-impact testing.** Loomis, B.A. (Argonne National Laboratory, IL (United States)); Nowicki, L.J.; Gazda, J.; Smith, D.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending*

March 31, 1993. 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Ductile-brittle transition temperatures (DBTTs) were determined by Charpy-impact tests for dehydrogenated and hydrogenated V-3Ti, V-5Cr-3Ti, and V-5Cr-5Ti alloys. These DBTT data complement the data previously obtained by Loomis et al. on Charpy-impact testing of unalloyed V, V-1Ti, V-3Ti-1Si, V-5Ti, V-10Ti, V-18Ti, V-4Cr-4Ti, V-8Cr-6Ti, V-9Cr-5Ti, V-10Cr-9Ti, V-14Cr-5Ti, V-15Cr-5Ti, V-7Cr-15Ti, and Vanstar-7 alloys. The results show that V alloys with Ti additions (0.18 wt.%) have a minimum DBTT (≈250°C) in an alloy containing 3-5 wt.% Ti, that addition of 4 to 15 wt.% Cr to V-(4-6)Ti alloy results in a substantial increase (25-215°C) of the DBTT, and that 0.5 and 1.0 wt.% Si additions to V-3Ti alloy result in a significant increase (≈100°C) in DBTT. In addition, the results show that the presence of 400-1200 appm H in unalloyed V and V-base alloys causes a significant increase (≈100°C) in DBTT. The results of these studies lead the authors to recommend the V-5Cr-5Ti alloy containing ≈400 ppm O, ≈200 ppm N, ≈200 ppm C, and ≈900 ppm Si for use as structural material in a fusion reactor.

14110 (DOE/ER–0313/14, pp. 329-330) **Status of fatigue studies on irradiated copper alloys.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Hamilton, M.L.; Stubbins, J.F.; Singhal, A.; Singh, B.N. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Irradiation continues in the EBR-II and DR-3 reactors of pure copper and GlidCop CuAl25 in the form of subsize tensile fatigue specimens. The first phase of the EBR-II irradiation sequence has been completed. A size effects experiment on unirradiated CuAl25 fatigue specimens is nearing completion. Early results on the fatigue behavior of subsize specimens are presented in this report.

14111 (DOE/ER–0313/14, pp. 331-344) **The response of dispersion-strengthened copper alloys to high fluence neutron irradiation at 415°C.** Edwards, D.J. (Univ. of Missouri, Rolla, MO (United States)); Newkirk, J.W.; Garner, F.A.; Hamilton, M.L.; Nadkarni, A.; Samal, P. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Various oxide-dispersion-strengthened copper alloys have been irradiated to 150 dpa at 415°C in the Fast Flux Test Facility (FFTF). The Al_2O_3-strengthened GlidCop™ alloys, followed closely by a HfO_2-strengthened alloy, displayed the best swelling resistance, electrical conductivity, and tensile properties. The conductivity of the HfO_2-strengthened alloy reached a plateau at the higher levels of irradiation, instead of exhibiting the steady decrease in conductivity observed in the other alloys. A high initial oxygen content results in significantly higher swelling for a series of castable oxide-dispersion-strengthened alloys, while a Cr_2O_3-strengthened alloy showed poor resistance to radiation.

14112 (DOE/ER–0313/14, pp. 345-346) **Neutron-induced swelling observed in copper alloys irradiated in MOTA's 2A and 2B.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Edwards, D.J.; Singh, B.N.; Watanabe, H. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Density measurements have been completed on copper alloys irradiated in MOTA 2A and MOTA 2B at (375°C, 12.7 dpa and 21.2 dpa) and (423°C, 48.0 and 95.4 dpa). While most of the density changes observed are consistent with those of earlier studies, there were several surprises. Addition of 5% Ni appears to accelerate the swelling rate initially at 423°C, but depresses swelling at 375°C. The suppressing action of cold work on swelling of Cu-5Ni is relatively small, and Cu-5Mn resists swelling very strongly in both the annealed and cold-worked conditions.

14113 (DOE/ER–0313/14, pp. 347-351) **Irradiation of copper alloys in the SM-3 reactor.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)); Garner, F.A.; Barabash, V.R.; Fabritsiev, S.A.; Pokrovsky, A.S. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

A total of 74 alloys of varying composition and thermomechanical condition have been prepared for a joint US-Russia irradiation experiment in the SM-3 reactor in Dimitrovgrad, Russia. The alloys will be irradiated in the form of TEM disks and sheet tensile specimens at temperatures of about 120, 250, and 340°C for one 45-day cycle in the core and Channel 2 irradiation positions. This will produce damage levels of about 7 and 1 dpa, respectively. Cadmium shielding will be used in the Channel 2 position to shield the thermal neutrons and thereby reduce the amount of solid transmutation products in copper.

14114 (DOE/ER–0313/14, pp. 352-362) **Effect of ion irradiation on the structural stability of dispersion-strengthened copper alloys.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)); Nesterova, E.V.; Rybin, V.V.; Barabash, V.R.; Naberenkov, A.V. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Transmission electron microscopy was used to compare the microstructure and particle distributions of two commercial oxide dispersion-strengthened copper alloys, GlidCop Al25 and MAGT 0.2. Measurements were made on specimens in their as-wrought condition, after thermal annealing for 1 h at 900°C, and after 3 MeV Ar^+ ion irradiation at 180 and 350°C to damage levels of 20 to 30 displacements per atom (dpa). All of the annealed and ion-irradiated specimens were found to be resistant to recrystallization. In addition, void formation was not observed in any of the irradiated specimens. The GlidCop oxide particle geometry was transformed from triangular platelets to circular disks by the ion irradiation. the MAGT particle geometry consisted of circular disks and spheres before and after irradiation. The oxide particle edge length in the unirradiated GlidCop alloy was about 10 nm, whereas the mean diameter of the particles in the unirradiated MAGT alloy was about 6 nm. After irradiation, the mean particle diameter in both the MAGT and GlidCop alloys was about 6 nm.

14115 (DOE/ER–0313/14, pp. 365-369) **Mass transfer in lithium/stainless steel test loop.** Luebbers, P.R. (Argonne National Laboratory, IL (United States)); Chopra, O.K. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract W-31109-ENG-38. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The plugged pipe removed from the cold-trap purification loop of the forced-circulation lithium system was examined to study mass transfer/deposition behavior and to establish the cause of plugging. Several intermetallic compounds were identified in residue collected from the plugged cold-trap pipe. Plugging was caused by deposition of calcium/zinc/nickel crystals in the pipe sections within the pump coil and flow-meter magnet. Addition of calcium as a getter to reduce the concentration of nitrogen in the lithium leads to formation of (Ca, Zn)Ni_5 crystals and subsequent plugging of the cold-trap loop. Deposits of manganese/iron/nickel globules and manganese/zinc/nickel dendrities, as well as Li_9CrN_5 and possibly Ca_3N_2, were also identified in the residue. These phases may have reduced flow through the cold-trap loop but were not abundant enough to plug the loop. The results indicate that the use of a dissolved getter, such as calcium, to reduce nitrogen content in an austenitic stainless steel loop may not be effective. Elements in the lithium form structural alloys (e.g., due to corrosion) and those added (e.g., calcium) to reduce the concentration of nonmetallic impurities (e.g., nitrogen) play an important role in the mass transfer/deposition behavior in circulating lithium systems.

14116 (DOE/ER–0313/14, pp. 370-379) **Compatibility of candidate structural materials with static gallium.** Luebbers, P.R. (Argonne National Laboratory, IL (United States)); Michaud, W.F.; Chopra, O.K. Oak Ridge National Lab., TN (United States). Jul

1993. DOE Contract W-31109-ENG-38. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Scoping tests were conducted on compatibility of gallium with candidate structural materials, e.g., Type 316 SS, Inconel 625, and Nb-5 Mo-1 Zr alloy, as well as Armco iron, Nickel 270, and pure chronimum. Type 316 stainless steel is least resistant and Nb-5 Mo-1 Zr alloy is most resistant to corrosion in static gallium. At 400°C, corrosion rates are ≈4.0, 0.5, and 0.03 mm/y for Type 316 SS, Inconel 625, and Nb-5 Mo-1 Zr alloy, respectively. The pure metals react rapidly with gallium. In contrast to findings in earlier studies, pure iron shows greater corrosion than does nickel. The corrosion rates at 400°C are ≥90 and 17 mm/y, respectively, for Armco iron and Nickel 270. The results indicate that at temperatures up to 400°C, corrosion occurs primarily by dissolution accompanied by formation of metal/gallium intermetallic compounds.

14117 (DOE/ER–0313/14, pp. 380-388) **Aqueous stress corrosion of candidate austenitic steels for ITER structural applications.** Soppet, W.K. (Argonne National Laboratory, IL (United States)); French, D.M.; Kassner, T.F. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract W-31109-ENG-38. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Susceptibility of crevice-weldment specimens of Types 316L and 316NG stainless steel (SS) to SCC was investigated in slow-strain-rate-tensile (SSRT) tests in water that simulates important parameters anticipated in first-wall/blanket systems. The SSRT tests were performed in oxygenated water containing 0.06-10 ppm chloride at temperatures of 95 to 225°C to establish the effects of water purity and temperature on SC resistance. These steels, including weldments, exhibit good resistance to SCC under crevice conditions at temperatures of <150°C in water containing ≤0.1 ppm chloride. It appears that Type 316NG SS is somewhat more resistant to SCC than Type 316L SS at temperatures >150°C in oxygenated water containing 0.1-10 ppm chloride. Most specimens fractured in the base metal, and several others fractured in the heat-affected zone (HAZ) of the weld, but none failed in the weld metal.

14118 (DOE/ER–0313/14, pp. 389-394) **Formation of electrically insulating coatings on aluminided vanadium-base alloys in liquid lithium.** Park, J.H. (Argonne National Laboratory, IL (United States)); Dragel, G. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract W-31109-ENG-38. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Aluminide coatings were produced on vanadium and vanadium-base alloys by exposure of the materials to liquid lithium that contained 3-5 at.% dissolved aluminum in sealed capsules at temperatures between 775 and 880°C. Reaction of the aluminide layer with dissolved nitrogen in liquid lithium provides a means of developing an in-situ electrical insulator coating on the surface of the alloys. The electrical resistivity of A1N coatings on aluminided V and V-20 wt.% Ti was determined in-situ.

14119 (DOE/ER–0313/14, pp. 395-404) **Corrosion fatigue of candidate austenitic steels for ITER structural applications.** Ruther, W.E. (Argonne National Laboratory, IL (United States)); Kassner, T.F. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract W-31109-ENG-38. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Crack-growth-rate (CGR) tests were performed on 1-in.-thick (1T) compact-tension (CT) specimens of Types 316NG and 316L stainless steel (SS) in oxygenated water containing 0-5 ppm Cl^- at 150, 185, and 225°C. The results obtained under cyclic loading conditions at stress intensity factors of ≈27 to 39 $MPa \cdot m^{1/2}$ indicate that environmental enhancement of the rates increases with Cl^- concentrations >0.1 ppm at 150°C in comparison with calculated rates in air under the specific loading conditions. In contrast, at the higher temperatures the CGRs were not affected by Cl^- in oxygenated water but were greater than the predicted rates in air by one order of magnitude.

14120 (DOE/ER–0313/14, pp. 405-410) **Development of aluminide coatings on vanadium-base alloys in liquid lithium.** Park, J.H. (Argonne National Laboratory, IL (United States)); Dragel, D. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Aluminide coatings were produced on vanadium and vanadium-base alloys by exposure of the materials to liquid lithium that contained 3/5 at.% dissolved aluminum in sealed V and V-20 wt.% Ti capsules at temperatures between 775 and 880°C. After each test, the capsules were opened and the samples were examined by optical microscopy and scanning electron microscopy (SEM), and analyzed by electron-energy-dispersive spectroscopy (EDS) and X-ray diffraction. Hardness of the coating layers and bulk alloys was determined by microidentation techniques. The nature of the coatings, i.e., surface coverage, thickness, and composition, varied with exposure time and temperature, solute concentration in lithium, and alloy composition. Solute elements that yielded adherent coatings on various substrates can provide a means of developing in-situ electrical insulator coatings by reaction of the reactive layers with dissolved nitrogen in liquid lithium.

14121 (DOE/ER–0313/14, pp. 415-425) **Ceramics radiation effects issues for ITER.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC05-84OR21400. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The key radiation effects issues associated with the successful operation of ceramic materials in components of the planned International Thermonuclear Experimental Reactor (ITER) are discussed. Radiation-induced volume changes and degradation of the mechanical properties should not be a serious issue for the fluences planned for ITER. On the other hand, radiation-induced electrical degradation effects may severely limit the allowable exposure of ceramic insulators. Degradation of the loss tangent and thermal conductivity may also restrict the location of some components such as ICRH feedthrough insulators to positions far away from the first wall. In-situ measurements suggest that the degradation of physical properties in ceramics during irradiation is greater than that measured in postirradiation tests. Additional in-situ data during neutron irradiation are needed before engineering designs for ITER can be finalized.

14122 (DOE/ER–0313/14, pp. 426-436) **Effect of irradiation spectrum of the microstructural evolution in oxide ceramics.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Cross section transmission electron microscopy was utilized to examine the radiation-induced microstructural changes in oxide ceramics after irradiation with a wide variety of ion beams. The microstructure showed a strong dependence on ion mass and energy. The microstructural results have been correlated with the calculated depth-dependent partitioning between ionization an displacement damage. This correlation indicates that defect clusters do not form in $MgAl_2O_4$ if the ratio of energy deposited into electronic ionization to atomic displacements is greater than about 10. The corresponding ratio needed to suppress defect cluster formation in MgO and Al_2O_3 is 500 to 1000. Additional microstructural evidence obtained on the irradiated ceramic specimens suggest that the physical mechanism responsible for the lack of defect clusters in highly ionizing radiation environments is associated with ionization-enhanced diffusion (IED), which promotes annihilation of the point defects created by displacement damage during the irradiation. The most important parameter for IED is the ratio of ionizing to displacive radiation, since this is roughly proportional to the amount of ionization per dpa. However, the absolute magnitude of the ionizing radiation flux is also important.

14123 (DOE/ER–0313/14, pp. 437-446) **Electrical conductivity of ceramic insulators during extended ion irradiation with an applied electric field.** Zinkle, S.J. (Oak Ridge National Laboratory, TN (United States)); Kesternich, W. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

The initial results are presented from a cyclotron ion irradiation program investigating radiation-induced conductivity (RIC) and radiation-induced electrical degradation (RIED) of ceramic insulators. Polycrystalline speciments of Al_2O_3, $MgAl_2O_4$, AlN and Si_3N_4 were irradiated with either 28 MeV He^{++} or 20 MeV H^+ ions at temperatures between 150 and 600°C with an applied dc electric field of 100 to 500 V/mm. A large prompt increase in the electrical conductivity was observed in all of the specimens during irradiation. However, there was no evidence for permanent electrical degradation in any of the speciments for damage levels up to about 5×10^{-3} displacements per atom.

14124 (DOE/ER–0313/14, pp. 447-450) **Irradiation of $MgAl_2O_4$ spinel in FFTF-MOTA.** Garner, F.A. (Pacific Northwest Laboratory, Richland, WA (United States)); Hollenberg, G.W.; Black, C.A.; Bradt, R.C. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

$MgAl_2O_4$ spinel specimens irradiated in FFTF-MOTA at temperatures between 385 and 750°C to fluences ranging from 2.2 to 24.9 $\times 10^{22}$ n cm^{-2} (E>0.1 MeV) darken significantly, but do not develop any loss in weight or change in dimensions. Measurements of knoop hardness and its dependence on crystalline orientation, neutron fluence and irradiation temperature are in progress. Measurements of elastic properties are also nearing completion.

14125 (DOE/ER–0313/14, pp. 451-456) **High-temperature properties of SiC/SiC for fusion applications.** Jones, R.H. (Pacific Northwest Laboratory, Richland, WA (United States)); Henager, C.H. Jr. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract AC06-76RL01830. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

SiC/SiC composites exhibit novel mechanical properties relative to their monolithic counterparts. The crack velocity (da/dt) versus stress intensity (K) relationship for monolithic ceramics can be described by a simple power law relationship where SiC/SiC was found to exhibit a multi-stage da/dt versus K relationship similar to that for stress corrosion of metals. A K independent stage II was followed by a strongly K dependent stage III which paralleled the monolithic behavior. Experiments to determine the threshold K or stage I were not conducted; however, it is expected that they exist for these materials. There is also evidence that the fracture resistance of these materials is greater if cracks are produced by subcritical growth processes relative to machined notches. Oxygen was found to increase da/dt and decrease the K for the stage II to stage III transition while cyclic loads produced little damage at low K values but there was some evidence for increasing damage with increasing number of cycles and K.

14126 (DOE/ER–0313/14, pp. 457-464) **Measurement of DC electrical conductivity of alumina during spallation-neutron irradiation.** Farnum, E.H. (Los Alamos National Laboratory, NM (United States)); Clinard, F.W. Jr.; Kennedy, J.C. III; Sommer, W.F.; Dammeyer, M.D. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

An irradiation experiment was carried out during the summer of 1992 at the Los Alamos Spallation Radiation Effects Facility (LASREF). In situ measurements of electrical conductivity in alumina, sapphire and mineral-insulated electrical cables were made at 640°C, 590°C and 400°C. Both DC and AC (100 Hz to 1 MHz) measurements were made to fluence of approximately 3×10^{23} n/m^2. Optical absorption from 200 nm to 800 nm was measured in pure silica - and OH-doped silica-core optical fibers during the irradiation. A large number of passive samples were included in the irradiation, some at the furnace temperatures and some at ambient temperature. This report describes preliminary analysis of the DC conductivity measurements. The AC measurements are analyzed in the companion report. All samples are being recovered for post-irradiation examination as this report is being written in May, 1993. Final analysis of the conductivity data awaits the results of measured fluence from activation foils and will be published at ICFRM-6.

14127 (DOE/ER–0313/14, pp. 465-474) **Measurement of AC electrical conductivity of single crystal Al_2O_3 during spallation-neutron irradiation.** Kennedy, J.C. III (Los Alamos National Laboratory, NM (United States)); Farnum, E.H.; Sommer, W.F.; Clinard, F.W. Jr. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Samples of single crystal Al_2O_3, commonly known as sapphire, and polycrystalline Al_2O_3 were irradiated with spallation neutrons at the Los Alamos Spallation Radiation Effects Facility (LASREF) under various temperature conditions and with a continuously applied alternating electric field. This paper describes the results of measurements on the sapphire samples. Neutron fluence and flux values are estimated values pending recovery and analysis of dosimetry packages. The conductivity increased approximately with the square root of the neutron flux at fluences less than 3×10^{21} n/m^2. The increase in conductivity reached saturated levels as high as 2×10^{-2} $(ohm\text{-}m)^{-1}$ at fluences as low as 2×10^{22} n/m^2. Frequency swept impedance measurements indicated a change in the electrical properties from capacitive to resistive behavior with increasing fluence.

14128 (DOE/ER–0313/14, pp. 475-479) **Irradiation effects in ceramics: Transition from low to high dose behavior.** Clinard, F.W. Jr. (Los Alamos National Laboratory, NM (United States)); Farnum, E.H. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Ceramics subjected to irradiation show a wide range of damage responses, depending on composition, nature of bonding, crystal structure, impurity levels, starting microstructure, number of phases, and type of bombarding particle. As doses reach high levels (a condition that varies in magnitude from one material to another) major changes in physical properties can occur, and atomic arrangements may even change from crystalline to disordered. However, some ceramics show marked resistance to damage, and some properties may improve. More work is needed to fully understand these phenomena, but it is currently possible in many cases to predict at least qualitatively both microstructural damage response and observed property changes.

14129 (DOE/ER–0313/14, pp. 480-483) **The effect of radiation induced electrical conductivity (RIC) on the thermal conductivity.** White, D.P. (Oak Ridge National Laboratory, TN (United States)). Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

Microwave heating of plasmas in fusion reactors requires the development of microwave windows through which the microwaves can pass without great losses. The degradation of the thermal conductivity of alumina in a radiation environment is an important consideration in reliability studies of these microwave windows. Several recent papers have addressed this question at higher temperatures and at low temperatures. The current paper extends the low temperature calculations to determine the effect of phonon-electron scattering on the thermal conductivity at 77 K due to RIC. These low temperature calculations are of interest because the successful application of high power (>1 MW) windows for electron cyclotron heating systems in fusion reactors will most likely require cryogenic cooling to take advantage of the low loss tangent and higher thermal conductivity of candidate window materials at these temperatures.

14130 (DOE/ER–0313/14, pp. 484-494) **Surface preparation effects in near surface modulus measurement for CVD SiC.** Osborne, M.C. (Rensselaer Polytechnic Institute, Troy, NY (United States)); Steiner, D.; Snead, L.L. Oak Ridge National Lab., TN (United States). Jul 1993. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

This study was performed to determine the variation in the measured modulus resulting from the use of various polishing grits on CVD SiC when taking shallow indents (20 nm) on a SiC/Nicalon™ composite sample. When ion bombarding the SiC composite, the ion penetration is only a few microns. To measure the modulus as a function of the damage level, Nanoindenter™ indents are made on the material in cross-section at various depths below the surface presented to the incoming ions. The purpose of making shallow indents is to minimize the volume sampled at a given depth, which leads to a more accurate determination of the modulus at any damage level.

14131 (DOE/ER–0313/14, pp. 495-518) **Micromechanics of fiber pull-out and crack bridging in SCS-6 SiC- CVD SiC composite system at high-temperature.** El-Azab, A. (Univ. of California, Los Angeles, CA (United States)); Ghoniem, N.M. Oak Ridge National Lab., TN (United States). Jul 1993. DOE Contract FG03-91ER54115. In *Fusion reactor materials semiannual progress report for the period ending March 31, 1993.* 524p. Order Number DE94006108. Source: OSTI; NTIS; INIS.

A micro mechanical model is developed to study fiber pull-out and crack bridging in fiber reinforced SiC-SiC composites with time dependent thermal creep. By analyzing the creep data for monolithic CVD SiC (matrix) and the SCS-6 SiC fibers in the temperature range 900-1250°C, it is found that the matrix creep rates can be ignored in comparison to those of fibers. Two important relationships are obtained: (1) a time dependent relation between the pull-out stress and the relative sliding distance between the fiber and matrix for the purpose of analyzing pull-out experiments, and (2) the relation between the bridging stress and the crack opening displacement to be used in studying the mechanics and stability of matrix crack bridged by fibers at high temperatures. The present analysis can also be applied to Nicalon-reinforced CVD SiC matrix system since the Nicalon fibers exhibit creep characteristics similar to those of the SCS-6 fibers.

14132 (DOE/ER/53207–10) **Collisional and chaotic transport of energetic particles in toroidal plasma: [Annual] progress report.** Cary, J.R.; Shasharina, S.G. Colorado Univ., Boulder, CO (United States). Dept. of Astrophysical, Planetary, and Atmospheric Sciences. Mar 1993. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER53207. Order Number DE94006504. Source: OSTI; NTIS; INIS; GPO Dep.

Progress is reported in three general areas of confinement plasma physics: (1) An accurate theory was developed for the trapping/detrapping process in tokamaks with ripple and stellarators. (2) The alpha particle distribution was determined for the situation where both collisions and collisionless chaotic (ripple) transport are present. Transport of the toroidally trapped particles in rippled tokamaks with up-down asymmetry was studied.

14133 (DOE/ER/53243–5) **Coaxial Slow Source: Final technical report, November 16, 1991–November 15, 1993.** Brooks, R.D.; Jarboe, T.R. Washington Univ., Seattle, WA (United States). Aerospace and Energetics Research Program. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER53243. (UWAERP–42). Order Number DE94008191. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes work performed by the University of Washington Aerospace and Energetics Research Program involving the Field Reversed Configuration (FRC) approach to magnetic confinement fusion. The group's effort involved continued research on the Coaxial Slow Source annular FRC experimental device located on campus, as well as support for the Large s Experiment (LSX) operated by Spectra Technology Incorporated, Bellevue, Washington.

14134 (DOE/ER/54137–T1) **Neutronics and nuclear data requirement for fusion reactors: [Annual] performance report, July 1992–August 1993.** Cheng, E.T. TSI Research, Inc., Solana Beach, CA (United States). Aug 1993. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-92ER54137. Order Number DE94008572. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes project activities and accomplishments for the following: (a) fusion nuclear data coordination activities and (b) neutronics and activation analysis.

14135 (DOE/ET/53088–628) **On the interpretation of diamagnetic loop measurements for a current-carrying plasma column in a conducting chamber.** Aleynikov, A.N. (AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki); Cherkassky, V.S.; Knyazev, B.A.; Breizman, B.N. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Oct 1993. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–628). Order Number DE94007107. Source: OSTI; NTIS; INIS; GPO Dep.

A general expression is derived for the signal of a magnetic loop encircling a plasma column inside a conducting chamber with nonuniform current distribution over the plasma cross-section. The ratio of the paramagnetic component to the diamagnetic component of the signal is shown to be independent of the loop radius. Both components increases the loop radius decreases from the chamber radius to the plasma radius. From the derived expressions, the paramagnetic component of the signal is calculated numerically for several current distributions including those of interest for the experiments. At a given total current, the paramagnetic component of the signal may vary considerably, which generally has to be taken into account in interpreting experimental data. The results of the calculations are used to process the data obtained in the experiments on the SPIN plasma device.

14136 (DOE/ET/53088–646) **Magnetless magnetic fusion.** Beklemishev, A.D. (Univ. of Texas, Austin, TX (United States). Inst. for Fusion Studies); Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Feb 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. (IFSR–646). Order Number DE94007114. Source: OSTI; NTIS; INIS; GPO Dep.

The authors propose a concept of thermonuclear fusion reactor in which the plasma pressure is balanced by direct gas-wall interaction in a high-pressure vessel. The energy confinement is achieved by means of the self-contained toroidal magnetic configuration sustained by an external current drive or charged fusion products. This field structure causes the plasma pressure to decrease toward the inside of the discharge and thus it should be magnetohydrodynamically stable. The maximum size, temperature and density profiles of the reactor are estimated. An important feature of confinement physics is the thin layer of cold gas at the wall and the adjacent transitional region of dense arc-like plasma. The burning condition is determined by the balance between these nonmagnetized layers and the current-carrying plasma. They suggest several questions for future investigation, such as the thermal stability of the transition layer and the possibility of an effective heating and current drive behind the dense edge plasma. The main advantage of this scheme is the absence of strong external magnets and, consequently, potentially cheaper design and lower energy consumption.

14137 (DOE/FTR–94004153) **Travel to Japan to participate in RF meetings for plasma heating: Foreign trip report, November 8–21, 1993.** Takase, Yuichi. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. 10 Dec 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-78ET51013. Order Number DE94004153. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of this trip was to present a paper at the IAEA Technical Committee Meeting on RF Launchers for Plasma Heating and Current Drive (November 10–12, 1993, Naka, Japan) and a second paper at the 5th International Toki Conference on Plasma Physics and Controlled Nuclear Fusion: Physics and Technology of Plasma Heating and Current Drive (November 16–19, 1993, Toki, Japan). Since this was the first time that experimental results from C-Mod were presented in Japan, the presentations were received with much interest. Main results from JT-60U were achievements of high fusion performance in the "high β_p H-mode" and 3.6 MA full current drive with LHCD. JET is currently installing their new ICRF and LHCD launchers, and Tore Supra will be installing new LHCD

launchers. Developments in technology in all frequency ranges of RF and NNBI in both Japan and Europe are quite impressive. In ECRF, gyrotron development and window development are making good progress. In LHRF, different methods of power splitting into numerous waveguides are being tested and theoretical work is progressing on the "quasioptical grill." In ICRF, the "spiral antenna" to be tested on JFT-2M was a new development. FWCD antennas work well with the use of a "decoupler."

14138 (DOE/FTR--94004467) **Travel to Japan to work as Safety Liaison Officer for the Naka ITER site: Foreign trip report, June--December 1993.** Holland, D.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE94004467. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The purpose of the trip was to interact with the ITER design team to provide safety guidance and safety assessment of the design. The activities at Naka that impact nuclear safety are design of the magnets, tritium plant, and cryostat. Some findings are reported on each of these areas.

14139 (DOE/SF/18862--T2) **Fusion with highly spin polarized HD and D_2: Final report, December 14, 1991--June 30, 1993.** Honig, A. (Syracuse Univ., NY (United States). Dept. of Physics); Letzring, S.; Skupsky, S. Syracuse Univ., NY (United States). Dept. of Physics. 17 Dec 1993. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-91SF18862. Order Number DE94006209. Source: OSTI; NTIS; INIS; GPO Dep.

The experimental efforts over the past 5 years have been aimed at carrying out ICF shots with spin-polarized D fuel. The authors successfully prepared polarized D in HD, and solved the problems of loading target shells with their carefully prepared isotopic mixtures, polarizing them so that the D polarization remains metastably frozen-in for about half a day, and carrying out the various cold transfer requirements at Syracuse, where the target is prepared, and at Rochester, where the cold target is inserted into the OMEGA fusion chamber. A principal concern during this past year was overcoming difficulties encountered in maintaining the integrity of the fragile cold target during the multitude of cold-transfers required for the experiment. These difficulties arose from insufficient rigidity of the cold transfer systems, which were constrained to be of small diameter by the narrow central access bore of the dilution refrigerator, and were exacerbated by the multitude of required target shell manipulations between different environments, each with different coupling geometry, including target shell permeation, polarization, storage, transport, retrieval and insertion into OMEGA. The authors did solve all of these problems, and were able to position a cold, high density but unpolarized target with required precision in OMEGA. Upon shooting the accurately positioned unpolarized high density cold target, no neutron yield was observed. Inspection inside the OMEGA tank after the shot indicated the absence of neutron yield was due to mal-timing or insufficient retraction rate of OMEGA's fast shroud mechanism, resulting in interception of at least 20 of the 24 laser beams by the faulty shroud. In spite of this, all elements of the complex experiment the authors originally undertook have been successfully demonstrated, and the cold retrieval concepts and methods they developed are being utilized on the ICF upgrades at Rochester and at Livermore.

14140 (ENEA-RT-ERG-FUS--93-08) **8 GHz, high power, microwave system for heating of thermonuclear plasmas.** Di Giovenale, S. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Fortunato, T.; Mirizzi, F.; Roccon, M.; Sassi, M.; Tuccillo, A.A.; Maffia, G.; Baldi, L. No corporate text available. 1993. 8p. (CONF-9309341--1: 23. European microwave conference, Madrid (Spain), 6-9 Sep 1993; RT/ERG-FUS--93-08). Order Number DE94752535. Source: OSTI; NTIS (US Sales Only).

The Frascati Tokamak Upgrade (FTU) is a machine included in the European Thermonuclear Fusion Program aimed at investigating high density plasmas in the presence of powerful additional RF heating systems. The Lower Hybrid Resonant Heating (LHRH) system, based on 9 independent modules, works at 8 GHz, and will generate, at full performances, a total amount of 9 MW, in the pulsed regime (pulse length = 1 s, duty cycle = 1/600). The microwave power source is a gyrotron oscillator, developed by Thomson Tubes Electroniques (France) for this specific application, and capable of producing up to 1 MW. An overmoded, low loss, circular waveguide transmits the RF power toward the plasma; an array of 12x4 rectangular waveguides (the 'grill') launches this power into the plasma. The paper describes the LHRH system for FTU and analyses both its main performances and experimental results.

14141 (ENEA-RT-NUCL--92-24) **Contributions to 17. symposium on fusion technology.** ENEA, Frascati (Italy). Area Nucleare. Dec 1992. 113p. (CONF-920930--: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

From the Contributions to the 17th Symposium on Fusion Technology (Rome, September 14 - 18, 1992), separate abstracts were prepared for 18 papers. The topics included: fusion reactor environmental impacts, tritium recovery, plasma current upgrading, transport codes for EURATOM's IGNITOR tokamak, the brazing of ceramic windows, plasma facing component coatings, operating experience with the Frascati Tokamak Upgrade, high speed pellet injection, NET (Next European Torus) vacuum vessel welding, superconducting coil testing, and specifications for the ITER (International Thermonuclear Experimental Reactor) driver blanket.

14142 (ENEA-RT-NUCL--92-24, pp. 21-25) **Glow discharge for FTU machine.** Ciotti, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Verdini, L.; Ferro, C. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930--: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology*. 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The possibility of applying H2 glow discharge cleaning for the conditioning of the FTU vacuum chamber has been analyzed on a 1: 1 scale toroidal sector. The optimization of the surface conditioning acquires relevant importance because of the complexity the inner wall geometry. The FTU vacuum chamber is completely covered by thermal shields that originate hidden regions not exposed to the discharge. Thus, the best procedure to clean both the exposed surfaces simultaneously is the combined operation of baking plus glow discharge.

14143 (ENEA-RT-NUCL--92-24, pp. 27-31) **Experimental results and upgrading of plasma current and position control in FTU.** Neri, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Riva, M.; Apruzzese, G.; Buceti, G.; Crisanti, F.; Frigione, D.; Kroegler, H.; Lovisetto, L.; Mazzitelli, G.; Podda, S. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930--: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology*. 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

At present, the FTU (Frascati Tokamak Upgrade) is working with a wide gap between the time constant (1 ms) of the passive structure and the active time constant (25 ms) of the whole feedback system. An overview of the last experimental results in the plasma current and position is presented together with the drawbacks connected with the situation. Some system upgradings are under development. Attention is given to the on-line magnetic measurement processing apparatus based on a VME architecture with an OS/9 real-time operating system. This system acquires values of the poloidal flux and the angular components of the magnetic field and, using a mathematical model, calculates and gives the horizontal and vertical position of the plasma, which is the input for the position control system. The system features high speed in data acquisition and processing (< 1 ms), configurability and flexibility. It uses the OS-9 operating system in Ethernet network with the central VAX/VMS. This link has a very high data-transfer velocity due to a special driver. Another useful characteristic of the VME system is the possibility of code development directly from the VAX/VMS to a diskless configuration, using Remote Disk Server and Remote Login functions.

14144 (ENEA-RT-NUCL–92-24, pp. 33-37) **Final tests on FTU LHRF prototype coupling structure.** Di Giovenale, S. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Papalini, M.; Petrosino, S.; Poggi, C.; Roccon, M.; Schettini, G.; Tuccillo, A.A. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The FTU (Frascati Tokamak Upgrade) 8 GHz lower hybrid antenna is an assembly of 3 standard grills each with 4x12 waveguides. Three of the antennas will feed three equatorial ports of FTU. The main goal is to routinely inject RF into the plasma at very high power density (parallel), as already demonstrated on the FT preliminary experiments. Due to the FTU narrow accesses and n requirements, the FTU antennas present advanced technological solutions such as the multi-window flange. To test the power capability, each grill of the first antenna was successfully processed at nominal RF power with a large number of RF pulses, while destructive tests were performed on the more critical items to ascertain their limits. Results of these tests are reported together with the RF measurements needed to characterize the whole prototype.

14145 (ENEA-RT-NUCL–92-24, pp. 39-43) **3-D neutron transport calculations for activation and dose assessment for IGNITOR.** Batistoni, P. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Ciattaglia, S.; Zucchetti, M.; Rollet, S. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

IGNITOR is a proposed, high magnetic field tokamak aimed at reaching ignition conditions in a DT plasma and at studying the physics of a ignited plasma for a period of few seconds. Its design has evolved since it was first proposed, in order to keep up with the most recent developments in the physics of magnetically confined plasma. The version called IGNITOR-ULT is the latest result of this evolution. The reference set of parameters adopted for this work is the following: major radius 130 cm; minor radii 47 and 87 cm; magnetic field 13 T; plasma current 12 MA; pulse length 4 s (flat-top); plasma density $10^{1}5\ cm^{-3}$; plasma temperature 12 keV; fusion power 90 MW; neutron yield 3. $2x10^{1}9n/s$; neutron wall load 2 MW/m^2. The purpose of this work is to implement a neutronic analysis of the machine by means of the 3-D code MCNP, in order to determine the neutron and gamma fluxes in all the regions of interest in the machine, the integrated doses on selected components and the neutron induced radioactivity and contact dose rates in relevant points of the structure. To perform the last point of the analysis, the inventory code ANITA is being utilized.

14146 (ENEA-RT-NUCL–92-24, pp. 51-55) **New method for multiple, brazing of ceramic windows to single flange.** Ferro, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Orsini, A.; Sacchetti, M. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The lower hybrid experiment in the FTU (Frascati Tokamak Upgrade) was designed to inject up to 8 MW, 8 GHz pulsed power into the plasma. The main technical problems to overcome in the design of the launching structures for injecting lower hybrid power into the plasma is how to reduce the probability of breakdowns inside the waveguides The philosophy adopted was to pressurize the waveguides by inserting ceramic windows close to the mouth of the grill. In the FTU, this separation was made by an array of 12x4 waveguides consisting of 48 ceramic (alumina) windows brazed onto a single titanium base alloy flange which achieves the vacuum-atmosphere transition. Prototypes of this flange have already been realized by modifying the method used for brazing single windows. The results were not completely satisfactory: the vacuum tightness was obtained but several micro-cracks were observed as a consequence of high local stresses due to the formation of intermetallic compounds. This paper describes the new method that was successfully developed by substituting the Cu-Ageutectic brazing alloy with Ag-Alloy and inserting a ductile cushion between the ceramic and the metal in order to reduce the loads acting on the ceramic.

14147 (ENEA-RT-NUCL–92-24, pp. 63-67) **NET mechanical fasteners-measurement of tensile properties of materials at 4 K temperature and evaluation of antiseizure behaviour of coatings and lubricants.** Alessandrini, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Bettinali, L.; Di Pietro, E. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

In the NET tokamak Task RHS 1-7 on the Qualification of Remote Handling Standard Components: Mechanical Fasteners, two areas were addressed: the mechanical properties at liquid helium temperature of the materials for the fasteners to be used in the assembly of the structure of superconducting magnets, and the performance of a number of possible coatings/lubricants for avoiding the seizure of fasteners operating under high specific loads on threads and under high vacuum, in a range of temperatures from -196 C to 350 C. As for the evaluation of the tensile and thermal-elastic properties at 4 K, three metallic materials, whose use is currently envisaged for the fasteners (ASTM 453 Grade 660, Inconel 718, and Marinel Hyduron) were tested. The results in terms of tensile and ultimate strength, elastic modulus, elongation, reduction of cross section area at rupture and coefficient of thermal expansion are reported. The second part of the activities consisted in comparing the anti-seizure performance of coatings and lubricants applied with various techniques to the threads and under bolt head. The results in terms of estimated friction coefficients and effects of the tightening/slackening cycles on the coated/lubricated surfaces, together with a critical analysis of the relative effectiveness of the different surface treatments are reported.

14148 (ENEA-RT-NUCL–92-24, pp. 69-73) **Operating experience in commissioning first 1 MW, 8 GHz LHRH module for Frascati Tokamak Upgrade.** Andreani, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Fortunato, T.; Gourlan, C.; Mirizzi, F.; Roccon, M.; Sassi, M.; Schettini, G. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The Frascati Tokamak Upgrade (FTU) is a machine aimed at investigating high-density thermonuclear plasmas in the presence of a powerful additional heating system operating in the lower hybrid range of frequencies. A total amount of 9 MW, 8 GHz, 1s pulse length is generated through 9 independent modules rated at 1 MW each. The modules are based on 1 MW, 8 GHz gyrotron oscillators, developed at Thomson Tubes Electroniques (TTE, France) and, as a back up solution, on 500 kW, 8 GHz, side-coupled gyrotron oscillators developed at Varian Ass.es (USA) in cooperation with Alenia (Italy). The first 1 MW gyrotron has been tested at the factory, either on a matched load or in the presence of an adjustable mismatch. The 500 kW, 8 GHz, 1s gyrotron, developed by Alenia-Varian, has also been tested at the factory, producing successful and promising results. Both gyrotrons will be used to start the RF experiment on the FTU machine at 1. 5 MW generated RF power.

14149 (ENEA-RT-NUCL–92-24, pp. 75-79) **High-speed pellet injectors for Frascati Tokamak Upgrade.** Frattolillo, A. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Migliori, S.; Angelone, G.; Baldarelli, M.; Capobianchi, M.; Domma, C.; Morelli, F.; Buceti, G.; Micozzi, P.; Tonini, G. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

A completely engineered high-speed single D2 pellet injector (SPIN) has been installed and operated on the Frascati Tokamak Upgrade (FTU). A description of SPIN performance and of the preliminary results obtained by injection of pellets in ohmic discharges

is given. Preliminary tests of a multi-shot pellet injector prototype, equipped with eight barrels and eight independent miniaturized two-stage guns are also reported.

14150 (ENEA-RT-NUCL–92-24, pp. 81-85) **Preliminary occupational radiation dose assessment for NET/ITER plant.** Ciattaglia, S. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Sandri, S.; Cambi, G.; Cavallone, G.; Cepraga, D.G. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The Occupational Radiation Exposure (ORE) evaluation is part of the safety analysis process whose purpose is to permit the optimization of production, according to the basic recommendations of the ICRP (International Commission on Radiation Protection). This paper presents the criteria adopted in order to evaluate the ORE during the normal operation and maintenance of NET/ITER (Next European Tokamak)/(International Thermonuclear Experimental Reactor) and some preliminary results. The analyses performed are related to a few systems and components of the tokamak and tritium buildings.

14151 (ENEA-RT-NUCL–92-24, pp. 87-91) **Approach to remote welding and cutting operations applied to NET vacuum vessel secondary sealing.** Bitti, G. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Cassandro, L.; Cecchini, A.; Di Pietro, E.; Harrison, R.M.; Cerri, W.; Mor, G. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The NET vacuum vessel is an AISI 316 L stainless steel structure with a modular configuration consisting of 16 parallel segments and 16 wedge segments. Various techniques have been envisaged for the final assembly. One possible solution envisages a final bolted assembly of the segments. Of course, apart from the mechanical continuity of the structure, it is necessary to assure the vacuum tightness of the assembly. In this version, the sealing of the junction between the segments is entrusted to a double containment sealing consisting of a typical double-U welded seal plus a secondary sealing obtained by the direct welding of a strip on the facing sides of two abutting segments. This paper describes the results obtained in the effort to validate the feasibility of remote TIG welding for the secondary sealing and the possibility of remote cutting with a Nd-YAG laser for maintenance purposes.

14152 (ENEA-RT-NUCL–92-24, pp. 93-97) **Engineering feasibility study of OMITRON device.** Palmieri, R. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Pizzuto, A.; Sestero, A.; Barberis, U.; Lanzavecchia, L.; Pirozzi, M. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

The OMITRON proposal, as originally put forward in the early 80's, was a relatively small and inexpensive tokamak experiment, to which nevertheless the optimism of the currently fashionable Alcator scaling attached a predication of great performance. In the subsequent years, however, it has grown considerably in size - to cope with the sprouting out of increasingly pessimistic scaling laws. As for the current version, its main parameters are as follows: major radius 1. 50 m; minor radius 0. 42 m; elongation 2. 0; magnetic field 20 T; plasma current 15 MA. With reference to this version, the engineering of OMITRON has been recently revisited and subjected to a feasibility study jointly by the ENEA Fusion Department and the CITIF Consortium (firms FIAT, ANSALDO and ABB). As a result, it has been confirmed that the concept is sound and viable solutions exist for all the main engineering aspects of the project. It is to be pointed out that the obtained feasibility results are to a large extent independent of the linear dimensions of the device: namely, they would equally apply also to the original OMITRON proposal, which was about a factor of two smaller in linear dimensions (and about a factor of ten less expensive). While such small size would hardly allow (under current wisdom, at least) for the reaching of ignition, it is emphasized here that nevertheless it would still make for a greatly interesting experiment: for, indeed, it would allow researchers to conduct a most exhaustive investigation of the limits of that form of plasma heating which is still today earning the most credit - namely, ohmic heating.

14153 (ENEA-RT-NUCL–92-24, pp. 99-103) **Final tests of SULTAN 12T facility in split coil configuration.** Balsamo, E.P. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Della Corte, A.; Pasotti, G.; Ricci, M.V.; Spadoni, M.; Sacchetti, N.; Aebli, E.; Jakob, B.; Pasztor, G.; Rohleder, I. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

As already reported, in the framework of the conductor development program undertaken by the NET (Next European Torus) Team as a part of the EURATOM R&D fusion technology program, a decision was taken some years ago to modify the magnet system of the SULTAN facility in order to be able to test short samples of full-scale NET (or ITER) magnet conductors in a background field of about 12T. The major modifications concerned: the rearrangement of an already existing 6T Nb-Ti magnet in two split coils; the construction of two intermediate 9T Nb_3Sn coils; and the construction of a 12T Nb_3Sn solenoid in addition to a similar existing coil. The whole system allows the insertion of samples in the radial direction with a useful measurement length of the conductor of about 60 cm at 12T. When the above-mentioned steps of the program were accomplished, the system was assembled and inserted in its cryostat. After a series of preliminary cryogenic and electrical tests, the magnet system was successfully tested reaching the field design value. It represents the world's most powerful high-field test facility presently in operation.

14154 (ENEA-RT-NUCL–92-24, pp. 105-109) **Simulation of FTU RF power supply system by ATP code.** Candela, G. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)). ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

Different RF (Microwave Radiofrequency) heating systems are foreseen for the FTU machine. Work has been done to try to use a single type of high voltage power supply (HVPS) for the different systems. This paper describes the simulation of the behaviour of the HVPS module (105 kV, 40 A) when loaded by a75 kV, 50 A gyrotron for the ECRH (Electron Cyclotron Radiofrequency Heating) system. The simulation, carried out by the Alternative Transient Program (ATP) code on a PC-386 computer system, includes the models and a set of possible parameters for the transformers, star-point controllers, rectifier bridges, filtering units, feedback control and gyrotron. A specific method was tested and implemented in the feedback regulation system for the control of the voltage on the gyrotron during the current pulse. In order to validate the models used for HVPS representation, a simulation of the same module, loaded by a 90 kV, 25 A gyrotron already operating on the plant for the LHRH (Lower Hybrid Radiofrequency Heating) system, and field tests were performed. The results of this simulation and of the field tests are also reported.

14155 (ENEA-RT-NUCL–92-24, pp. 111-115) **Further neutronic analyses of European ceramic B.I.T. blanket for DEMO.** Petrizzi, L. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Rado, V.; Diop, C.; Giancarli, L. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology.* 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

This study concerns the most recent Monte Carlo code neutronic analyses of two design versions of the European ceramic B.I.T. (Breeder In Tube) blanket, jointly developed by ENEA (Italian Agency for Energy, New Technologies and the Environment) and CEA (Commissiarat a l'Energie Atomique). Last years developments required new 3-D geometry evaluations of the global TBR

(Tritium Breeding Ratio). The results indicated that the ENEA version reaches a global TBR value of 1.13. The CEA version, in a 3-D model using a simplified description of the breeder module layout, reaches a TBR value of 1.12. Nuclear heat deposition density was determined for all blanket components as a function of the poloidal co-ordinate. Shielding properties of this type of blanket were also analyzed.

14156 (ENEA-RT-NUCL–92-24, pp. 117-121) **Feasibility analysis of tritium batch recovery for ITER driver blanket.** Ferrari, M. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Mazzone, G.; Simbolotti, G.; Violante, V.; Zampaglione, V.; Caira, M.; Cumo, F.; Sorabella, L. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology*. 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

During the ITER (International Thermonuclear Experimental Reactor) conceptual design phase a reference driver blanket concept was selected, based on the use of a ceramic breeder ($LiAlO_2$ or Li_2O) with a low temperature (60-100 grade C) water cooling and on-line tritium recovery via He purging gas. Since tritium release from breeder materials requires an operation temperature greater than 400-450 grade C, the combination of low temperature cooling and tritium on line recovery are conflicting design requirements leading to the need of insulating thermal barriers between breeder and coolant which results in an increase of design complexity and feasibility concerns. To overcome this problem while maintaining the benefits of low temperature and pressure cooling, a tritium batch recovery procedure was preliminarly analysed: tritium could be accumulated in the breeder material during normal low temperature operation and then periodically recovered during scheduled reactor shut-down by heating the breeder via hot gas or steam and using decay heat. The results show that, assuming a maximum allowable tritium accumulation of about 500 gr in the breeder material, one reactor shut down every 5 days of continuous burning (corresponding to about 40 normal operation days at 12% reactor availability) is required for tritium extraction. The tritium recovery phase is expected to take 0.5 to 1.5 days, depending on the specific ceramic breeder used in the blanket and the recovery temperature.

14157 (ENEA-RT-NUCL–92-24, pp. 123-127) **Completion of testing of full size 40 kA conductor for NET.** Bruzzone, P. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany)); Mitchell, N.; Katheder, H.; Salpietro, E.; Ricci, M.V. ENEA, Frascati (Italy). Area Nucleare. Dec 1992. (CONF-920930–: 17. symposium on fusion technology (SOFT-17), Rome (Italy), 14-18 Sep 1992). In *Contributions to 17. symposium on fusion technology*. 113p. Order Number DE94002065. Source: OSTI; NTIS (US Sales Only).

To develop and manufacture prototype conductors suitable for the central solenoid of NET/ITER (Next European Tours/International Thermonuclear Experimental Reactor), in 1988 two contracts were placed to European industries for three versions of Wind and React (W/R) cable-in-conduit conductors. A detailed description of the manufacturing steps was published and the results of an extensive test programme on conductor subelements were later described. When the full-size short lengths of conductors (15 m each) were available, straight test samples were manufactured, with the correct geometry to fit into the FENIX facility at LLNL. The tests started in Dec. 1991 and were performed within the framework of the ITER collaboration. The main goals were: determination of the temperature margin under design operating conditions (current = 40 kA, field = 12.5 T); measurement of the hydraulic characteristics; determination of the effect of a large number of current pulses. Coupling losses on the full-size conductors had been measured earlier. In this paper, after a short description of the conductor layout and the facility, the testing procedures and the results are presented.

14158 (ETDE-IT–94-09) **8 GHz experiment on FTU.** Tuccillo, A.A. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Barbato, E.; Gabellieri, L. No corporate text available. 1993. 13p. (CONF-9308218–1: 2. international workshop on strong microwaves in plasmas, Nizhny Novgorod (Russian Federation), 15-22 Aug 1993). Order Number DE94752510. Source: OSTI; NTIS (US Sales Only).

The FTU (Frascati Tokamak Upgrade) 8 GHz Lower Hybrid system started operation with the first of its 9 gyrotrons. The 1 MW power output of the tube feeds a 12 x 4 waveguide grill obtaining, in routine operations, a net specific power higher than 10 kW/square centimeters. Good power coupling to the plasma is observed with reflection coefficients close to the theoretical expectations. Interaction of the launched waves with plasma electrons is detected up to a density of about 10^{20} m^{-3}.

14159 (ETDE-IT–94-12) **Dynamical model for IGNITOR experiment.** Airoldi, A. (Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. di Fisica del Plasma); Cenacchi, G. No corporate text available. 1993. 5p. (CONF-9307169–1: 20. EPS conference on controlled fusion and plasma physics, Lisboa (Portugal), 24-31 Jul 1993). Order Number DE94752513. Source: OSTI; NTIS (US Sales Only).

The IGNITOR experiment is designed to produce a significant amount of fusion power. Previous predictions of the machine performance were done in flat-top conditions for plasma current and toroidal magnetic field. This paper presents some results obtained from dynamic simulations of the plasma ramp-up and flat-top phases, with an enhanced version of the JETTO code. The temperature, electron and primary ion density, and current density profile are evolved self-consistently in time, together with the shape and the position of the free-boundary plasma. The equilibrium configurations obtained are consistent with the ones evaluated for the poloidal field coil design. The nominal machine and plasma parameters and the different scenarios planned for the current IGNITOR design were considered, including the most advanced one with I_p = 12MA and B_t = 13T. Different plasma growth scenarios were analyzed to optimize the global plasma performance. In particular, the effect of the rate of rise of the plasma current, toroidal magnetic field and plasma density are discussed. The results confirm that a carefully programmed ramp-up of the plasma current allows tokamak reactors to reach fusion regimes where the $q < 1$ region represents a small fraction of the plasma cross-section.

14160 (ETDE-IT–94-30) **Outgassing tests on graphites in temperature range 100-1600 degrees C.** Alessandrini, C. (Associazione EURATOM-ENEA sulla Fusione, Frascati (Italy)); Apicella, M.L.; Verdini, L. No corporate text available. 1993. 28p. (CONF-9303264–1: 12. national congress on vacuum science and technology, Bolzano (Italy), 23-26 Mar 1993). Order Number DE94752551. Source: OSTI; NTIS (US Sales Only).

Graphite is a an interesting material for plasma-facing components in fusion experiments, mainly because of its low atomic number and excellent thermal properties. Nevertheless, it contains a large amount of gaseous impurities, which can be released by plasma-surface interactions and affect the purity of the deuterium-tritium plasma. To investigate the outgassing behaviour of graphites, CFC's and doped C composites, a facility was set up to perform outgassing tests on samples, as a function of temperature in the range between 100 and 1600 degrees C. The experimental apparatus, designed to work in UHV conditions, allows outgassing measurements by a quadrupole mass spectrometer (1-200 AMU) using two different methods. The test facility, the quadrupole calibration and preliminary quantitative outgassing measurements on SEP CARB N112 samples are described.

14161 (GA-A–21487) **Operation of DIII-D with all-graphite walls.** Holtrop, K.L.; Jackson, G.L.; Kellman, A.G.; Lee, R.L.; Hollerbach, M.A. General Atomics, San Diego, CA (United States). Oct 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-9311104–15: 40. national symposium of the American Vacuum Society (AVS), Orlando, FL (United States), 15-19 Nov 1993). Order Number DE94004858. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, additional graphite coverage has been installed in the DIII-D tokamak, increasing the graphite tile coverage from 45% to ~90%. Due to a problem with copper impurity bursts during tokamak discharges, copper foam sheets between the graphite tiles and the Inconel wall have been replaced with GRAFOIL gaskets, which further increases the surface area of the graphite inside the DIII-D torus. Although additional graphite has the potential for improving DIII-D performance, if not properly conditioned it can also

degrade tokamak discharges by contributing to increased low Z impurity influx and higher particle fueling. To address these concerns, improvements were implemented both in tile preparation and wall conditioning techniques. All previously installed tiles were grit-blasted with boron-carbide grit to remove co-deposited metal impurities and all tiles were outgassed to 1000°C prior to installation. The glow discharge system used for wall conditioning was modified to include a large area electrode. The only conditioning techniques used were baking and helium conditioning to avoid producing loosely bound carbon. Previously, H^2 or D^2 Taylor discharge cleaning was used extensively during the vent recovery phase. Recovery from the recent 7-month machine opening was extremely rapid with improved modes of energy confinement (H-mode) transitions observed on the 14th plasma discharge. In addition, very high confinement (VH-mode) discharges were obtained without boronization, which is further indication of the rapid vent recovery. Lower recycling/lower fueling efficiency was also observed during operation with all-graphite walls. We will also discuss the use of Ne and Ar glow, and qualification of the new graphite including outgassing tests of the GRAFOIL material.

14162 (GA-A–21517) **Fusion applications of high power millimeter wave sources.** Freeman, R.L. (General Atomics, San Diego, CA (United States)); George, T.V. General Atomics, San Diego, CA (United States). Jan 1994. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER52153. (CONF-940132–1: International conference on millimeter and submillimeter waves, San Diego, CA (United States), 10-14 Jan 1994). Order Number DE94007374. Source: OSTI; NTIS; INIS; GPO Dep.

Heating by means of high power electron cyclotron (EC) waves in the mm wavelength range is considered to be one of the most attractive approaches for heating fusion plasmas to the temperatures required to achieve ignition. EC waves have also been used to drive plasma current by using directional launch and to stabilize MHD instabilities in tokamak plasmas through localized heating or current drive. Experiments are planned on both JET and TFTR to measure the alpha particle distribution by scattering EC waves.

14163 (INIS-mf–13749, pp. 75) **Laser driven fusion pellets.** Khoda-Bakhsh, R. (Urmia Univ., (Iran, Islamic Republic of). Dept. of Physics). Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center. 1993. 137p. (CONF-9308213–: 2. international conference on lasers and their applications, Teheran (Iran, Islamic Republic of), 23-26 Aug 1993). In *Abstracts of 2. international conference on lasers and their applications.* Order Number DE94617409. Source: OSTI; NTIS (US Sales Only); INIS.

Persian abstract can be found in the secord part of the document on p. 30.

Short communication. THERMONUCLEAR FUELS/inertial confinement; DEUTERIUM TRITIDE; THERMONUCLEAR IGNITION

14164 (INIS-mf–13760, pp. 45-51) **Overview of the pellet injection programme of Tore Supra.** Chatelier, M. (Association Euratom-CEA, Centre d'Etudes Nucleaires de Cadarache, 13 - Saint-Paul-lez-Durance (France). Dept. de Recherches sur la Fusion Controlee); Geraud, A.; Drawin, H.W. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The main results obtained with the centrifuge injector are briefly reviewed. Also, recent experiments are discussed that were made with the high-speed injector under different experimental conditions. 13 refs, 5 figs.

14165 (INIS-mf–13760, pp. 53-63) **Pellet injector research and development at ORNL.** Combs, S.K. (and others); Argo, B.E.; Barber, G.C. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. Contract DE-AC05-84OR21400. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Oak Ridge National Laboratory (ORNL) has been developing pellet injectors for plasma fueling experiments on magnetic confinement devices for over 15 years. Recently, ORNL has provided a tritium-compatible four-shot pneumatic injector for the Tokamak Fusion Test Reactor; this injector, which is based on the in situ condensation technique for pellet formation, features three conventional single-stage gas guns and an advanced two-stage light gas gun driver. In addition, the international collaboration and the Tore Supra tokamak in 1989 continue with an objective of improving injector performance. In a new application, the three-barrel repeating pneumatic injector that operated on the Joint European Torus from 1987 to 1992 has been returned to ORNL and is being readied for installation on DIII-D; this device consists of three independent, machine-gun-like mechanisms. Also, ORNL is developing advanced technologies, including high-velocity pellet injectors, tritium injectors, and long-pulse pellet feed systems. Two acceleration techniques for achieving higher velocities under experimental investigation at ORNL are the two-stage light gas gun and the electron-beam-driven rocket; the objective of these studies is the development of reliable systems capable of providing pellets with higher speeds (2-10 km/s) than available with conventional pneumatic or mechanical injectors. The tritium proof-of-principle (TPOP) experiment that operated between 1988 and 1989 demonstrated the basic scientific feasibility of the production and pneumatic acceleration of tritium pellets. A new tritium-compatible, extruder-based repeating pneumatic injector is being designed to replace the pipe gun in the TPOP experiment, and operation of this gun will explore issues related to the extrudability of tritium and acceleration of extruded pellets. The tritium experiments and development of long-pulse pellet feed systems are especially relevant to the International Tokamak Engineering Reactor.

14166 (INIS-mf–13760, pp. 65-70) **High-speed repetitive pellet injector prototype for magnetic confinement fusion research.** Frattolillo, A. (Associazione EURATOM-ENEA sulla Fusion, Frascati, Rome (Italy). Centro Ricerche Energia Frascati); Gasparotto, M.; Migliori, S. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The fuelling requirements of future magnetic confinement devices for controlled thermonuclear research (e.g. ITER) indicate a need to upgrade the performance (speed, mass, number of pellets, etc.) of present-day pellet injectors. An experiment in collaboration between ENEA Frascati and ORNL has been started, with the objective of demonstrating a repeating pellet injector capable of delivering D_2 ice pellets at rates around 1 Hz and with speeds in the range 1/3 km/s, using an existing ORNL extruder and a Frascati two-stage gun. This activity will be carried out in the framework of an collaborative agreement between U.S. D.O.E. and EURATOM - ENEA Association. The result of numerical simulations and preliminary tests of the two devices, which will be matched together in Oak Ridge, are described. The results of a study in course at CNPM-CNR (under ENEA contract) about the possibility of minimizing the piston wear, are also reported. 15 refs, 5 figs, 2 tabs.

14167 (INIS-mf–13760, pp. 71-75) **Injection of solid D_2 pellets into the Frascati tokamak upgrade.** Alladio, F. (Associazione EURATOM-ENEA sulla Fusione, Frascati, Rome (Italy). Centro Ricerche Energia Frascati); Buratti, P.; Frattolillo, A. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

A high-speed D_2 single-pellet injector (SPIN) has been in operation on the Frascati Tokamak Upgrade (FTU) machine since 15 July, 1992. In this work we compare the injector performance with simulation codes and report the experimental results of pellet-plasma interaction in ohmic discharges. The results of cryogenic experiments carried out with the high-speed multi-shot pellet

injector for FTU are also presented. In addition, work is being performed on the preliminary development of injectors that meet the requirements of tokamak machines having larger dimensions (or ITER/NET-type devices). 7 refs, 10 figs, 1 tab.

14168 (INIS-mf–13760, pp. 89-92) **Pellet injection studies in the R and D division of the LHD project.** Sato, K.N. (National Inst. for Fusion Science, Nagoya (Japan)); Sakakita, H.; Liang, R. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

For steady-state operation of the Large Helical Device continuous fueling such as by continuous pellet injection is considered essential. A stable and reproducible pellet operation is also required for the study of transport phenomena. The research and development activities on pellet injection aimed to meet these objectives are briefly discussed. 1 fig., 1 tab.

14169 (INIS-mf–13760, pp. 93-98) **Developments of high speed pellet injector at NIFS.** Sudo, S. (National Inst. for Fusion Science, Nagoya (Japan)); Kaneko, H.; Baba, T.; Shirai, T.; Kanno, M.; Saka, S. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

A high speed injector for Large Helical Device (LHD) of heliotron/stellarator type with superconducting soils at NIFS of MoE in Japan has been developed with an acceleration method of two-stage pneumatic gas gun. The pellet velocity reaches 3.3 km/s. Some optimizations for reliability of the operation have been carried out. Furthermore, the preliminary design of a high speed flexible multiple-pellet injection system ("HIPEL") for LHD with both 10 two-stage and 10 single-state acceleration barrels is proposed for refueling, plasma control, and diagnostics. (author). 7 refs, 5 figs, 3 tabs.

14170 (INIS-mf–13760, pp. 147-152) **Pellet injector technology at JET.** Kupschus, P.H. (Commission of the European Communities, Abingdon (United Kingdom). JET Joint Undertaking); Bailey, W.; Gadeberg, M.; Organ, M.; Twynam, P.; Watson, M. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The status of the pellet injector technology at JET is briefly reviewed. In particular, the high-speed single-pellet launcher's main design features and those of the pellet centrifuge are discussed. 4 refs, 3 figs.

14171 (INIS-mf–13760, pp. 153-160) **Pellet injector in JT-60U.** Hiratsuka, Hajime (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan)); Miyo, Yasuhiko; Ichige, Hisashi; Koike, Tsuneyuki; Shimizu, Masatsugu; Onozuka, Masanori. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

A pneumatic pellet injector has been installed in JT-60U to improve plasma performances. The objective of this system is to inject hydrogen or deuterium ice pellets into plasma. The JT-60U pellet injector is capable of accelerating separately four cylindrical pellets, sizes of which are 3.0 mm in diameter and 3.0 mm in length for two pellets and 4.0 mm in diameter and 4.0 mm in length for the remaining two, respectively. The main results obtained from performance tests of the pellet injector in JT-60U can be summarized as: (i) A pellet velocity of 1.76 km/s for a deuterium pellet; (ii) the operation conditions have been optimized to achieve a pellet fueling efficiency of 60-70 % on average. In this paper, the system configuration of JT-60U pellet injector and results of its performance tests are presented. 5 figs, 2 tabs.

14172 (INIS-mf–13760, pp. 161-166) **Recent results on pellet physics and technology for ITER in technical university.** Kuteev, B.V. (Technical Univ. Applied Physics Ltd, St. Petersburg (Russian Federation)); Egorov, S.M.; Kalmykov, S.G. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

The main activities in pellet injection technology for tokamak plasma fueling and diagnostics presently correspond to those formulated in the ITER tasks description, which includes (i) the development of a continuous pellet injector with moderate injector velocity, (ii) the development of an injector allowing pellet velocities greater than 5 km/s, (iii) further improvement of the pellet ablation model, (iv) the study of transport phenomena related to pellet injection, and (v) the development of plasma diagnostics based on both hydrogen and impurity pellet injection. This brief paper describes the work done by the group at the Technical University in St. Petersburg which is active is most of these areas. In particular, brief summaries are given for the following topics: (1) the pellet injector technology; (2) designs for cloud photography equipment to be used in ASDEX-Upgrade experiments for the photography of clouds near ablating pellets for the purpose of plasma diagnostics of magnetic field configurations; (3) work on the ablation model based on the analysis of T-10 tokamak ablation data; (4) radial transport studies based on the plasma response to pellet-injection induced perturbations; (5) longitudinal transport studies, in particular the toroidal plasma expansion observed using soft X-ray measurements on the T-10 tokamak; and (6) high-speed photography and pellet deflection analysis for rotational transform profile determination. 13 refs, 12 figs, 3 tabs.

14173 (INIS-mf–13760, pp. 167-172) **Single and multishot "in-situ" pellet injectors at St. Petersburg technical university.** Viniar, I. (St. Petersburg Technical Univ., St. Petersburg (Russian Federation)); Kuteev, B.; Kapralov, V.; Skoblikov, S.; Parshin, M.; Umov, A.; Koblents, P. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Single, four and eight barrel injectors with in-situ type pellet producing have been developed to perform investigations on the T-14, T-15 and CHL tokamaks consequently. All H_2 pellets are formed simultaneously in the barrels and can be shot with time intervals of 2 s and more. Helium gas under 110 bar pressure is typically used to accelerate pellets. Pellet velocities from 300 to 1200 m/s have been obtained. 4 refs, 3 figs.

14174 (INIS-mf–13760, pp. 173-178) **Development of injection-angle controllable system of ice pellets and its application to the JIPP T-IIU tokamak.** Sakakita, H. (National Inst. for Fusion Science, Nagoya (Japan)); Sato, K.N.; Liang, R.; Kawahata, K.; Kitagawa, H.; Sakamoto, M. JIPP T-IIU Group. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

A new technique for an ice pellet injection system with controllability of injection angle has been developed and installed with the JIPP T-IIU tokamak in order to vary the deposition profile of ice pellets within the plasma. The injection angle can be varied easily and successfully during an interval between two plasma shots in the course of an experiment, so that one can carry out various basic experiments by varying the pellet deposition profile. The injection angle has been varied poloidally from -6 to 6 degrees by changing the angle of the last stage drift tube. This situation makes

it possible for pellets to aim at about from r =-2a/3 to 2a/3 of the plasma. From two-dimensional observations by CCD cameras, details of the pellet ablation structures with various injection angles have been studied, and a couple of interesting phenomena has been found. A long helical tail of ablation light has been observed in the case of an injection angle smaller than a certain value. The direction of helical rotation (tail) is independent to that of the magnetic field lines of the torus. It seems to rotate to the electron diamagnetic direction poloidally, and to the opposite to the plasma current direction toroidally. Consideration on various cross sections including charge exchange, ionization and elastic collisions leads use to the conclusion that the tail-shaped phenomena may be the result of plasma rotation with the condition of charge exchange equilibrium of hydrogen ions and neutrals at high density regime. Thus, the system of variable angle injection may become a useful diagnostic tool for the plasma rotation measurement. 4 refs, 6 figs.

14175 (INIS-mf–13760, pp. 179-184) **Development of advanced railgun for injection of hypervelocity hydrogen pellets into tokamak.** Kim, K. (Illinois Univ., Urbana, IL (United States). Fusion Technology Lab.); Zhang, J.; King, T.L.; Windham, D.M. Jr; Bolt, L.S. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. Grant DE-FG02-84ER52111. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Advanced electromagnetic railguns at the University of Illinois that are specifically developed for injection of hypervelocity hydrogen pellets into a tokamak are described. Perforated side walls and transaugmentation schemes have been tested in an effort to improve the railgun performance. The principal diagnostics are the magnetic probes, laser interferometry, optical emission spectroscopy, and a streak camera which are designed to determine the plasma arc length, the electron density distribution along the length of the arc, the line-averaged plasma density and temperature, and the pellet velocity change during acceleration, respectively. Using a prototype systems hydrogen pellet velocities as high as 3.3 km/s have been achieved on a 2-m-long railgun for a cylindrical pellet of 3.2-mm diameter and 6-mm length. This report contains a brief overview of the University of Illinois railgun program, the results to date, and the future plan. 10 refs, 4 figs, 1 tab.

14176 (INIS-mf–13760, pp. 185-190) **Development of railgun pellet injector using a laser-induced plasma armature.** Onozuka, M. (Mistubishi Heavy Industries Ltd., Shibakoen, Tokyo (Japan). Advanced Nuclear Systems Engineering Dept.); Oda, Y.; Azuma, K.; Ogino, M.; Kasai, S.; Hasegawa, K. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

Electromagnetic railgun pellet injector has been investigated, aiming at high-speed pellet injection for fusion plasmas. A pellet pre-acceleration technique is used in order to reduce rail erosion. The plasma armature is induced by a pulse laser beam. This unique feature reduces the supplied voltage to the rails, in order to avoid unnecessary breakdown between the rails and to reduce rail erosion. The power supply for our system employs Pulse-Forming-Networks, which provides a rapid current-rise to the rails and control of the current-hold time, thereby enhancing acceleration efficiency. The ignited plasma armature is accelerated by an electromagnetic force, that accelerates the pellet to high velocity. A series of experiments using dummy pellets have been conducted to examine the system. In addition, the hydrogen pellet acceleration tests have been initiated. The current experimental results indicate that the railgun system can be one of the optimal methods to provide higher speed pellets for fusion plasmas. 13 refs, 6 figs, 1 tab.

14177 (INIS-mf–13760, pp. 191-195) **Railgun using permanent magnet for ice pellet injection.** Akiyama, H. (Kumamoto Univ., Kumamoto (Japan). Dept. of Electrical Engineering and Computer Science); Katsuki, S.; Eguchi, N.; Maeda, S.; Sato, K.N. International Atomic Energy Agency, Vienna (Austria). 1993. 195p. (CONF-9305227–: International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection, Naka (Japan), 10-12 May 1993). In *IAEA technical committee meeting on pellet injection.* Order Number DE94617115. Source: OSTI; NTIS (US Sales Only); INIS.

It is very important to reduce the erosion of the bore surface in a railgun in order to use a railgun as an ice pellet injector into a nuclear fusion plasma. One of the methods to reduce the erosion is a preacceleration of the projectile, and the other is to decrease the driving current. Gas guns, electrothermal guns and other railguns have been used to preaccelerate the projectile. Here, the new method using plasma initiation separated from the projectile (PISP method) is proposed to preaccelerate the projectile, and also it is proposed to sue a permanent magnet in order to decrease the driving current keeping the driving force constant. Their effects are confirmed experimentally. 3 refs, 6 figs.

14178 (INIS-mf–13779, pp. 7-16) **Present status of the Novillo Tokamak.** Colunga Sanchez, S. (Instituto Nacional de Investigaciones Nucleares, Mexico City (Mexico). Plasma Physics Lab.); Melendez Lugo, L.; Lopez Callejas, R.; Valencia Alavarado, R.; Chavez Alarcon, E.; Gaytan Gallardo, E. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

The Novillo Tokamaks is a small toroidal device with the main design parameters: R_0 = 0.23m, a_v = 0.08m, a_p = 0.06m., q = 3, B_T = 0.47T, 1_p 12kA, n_e = 2 x 10^{19} m^{-3}, T_e = 150eV, T_i = 50eV. At the present stage of the Novillo project we have obtained tokamak discharges with a plasma current of more than 12 kA and a line averaged density of 2.2 x 10^{19} m^{-3}, using approximately 70% of OHT energy. Studies for finding the optimum vessel conditioning process using Taylor discharges and stabilization of tokamak discharges have been performed. Main efforts have been concentrated on installing diagnostics: a 2-mm three channel microwave interferometer and a 9-mm reflectometer-interferometer are operating now: magnetic and electric probes, soft X-ray diagnostics and spectroscopy measurements with a 32 channel acquisition data system will be available soon. (author). 2 refs, 7 figs, 3 tabs.

14179 (INIS-mf–13779, pp. 92-98) **Elongated separatrix formation in COMPASS-D.** Todd, T.N. (AEA Technology, Culham (United Kingdom)). COMPASS Team. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

This is a very brief report on the recommissioning of the COMPASS tokamak following conversion from a bellows-type circular cross-section vacuum vessel to a smooth-walled (still continuous) D-shaped vessel for the purpose of experimentation aimed at controlling MHD activity in strongly elongated tokamaks, both with and without divertors. Comments are included on the toroidal resistance and on a vertical feedback control system. A less triangular shape of the magnetic field configuration was chosen to allow more clearance for the high-field-side ECRH mirror-antenna. At the time of this communication the Resonant Magnetic Perturbation system was expected to be recommissioned shortly, while commissioning of the 60 GHz ECHR system was progressing well. Early experimental results have already been obtained. 3 refs, 5 figs.

14180 (INIS-mf–13779, pp. 173-185) **Physics and engineering bases of APST machine.** Sinman, S. (Middle East Technical Univ., Ankara (Turkey). Electrical and Electronics Engineering Dept.); Sinman, A. International Atomic Energy Agency, Vienna (Austria). 1993. 244p. (CONF-9209420–: IAEA technical committee meeting on research using small tokamaks, Wuerzburg (Germany), 28-29 Sep 1992). In *Research using small tokamaks: A collection of papers presented at the IAEA technical committee meeting.* Order Number DE94621827. Source: OSTI; NTIS (US Sales Only); INIS.

In this study, the Axially Pinched Spherical Torus (APST) machine is submitted with a view point of conceptual design. The numerical model at that of the design is the composition based on the methods and principles of such as Z-pinch, shock heating and Peng's and Taylor's papers on the features of spherical torus plasma and the current drive by helicity injection respectively. The APST machine is consisting of 20 C-guns placed around the flux conserver with the equal angular intervals of 18 degrees symmetrically with respect to the axis. The system all together is in a gas mantle. By means of spark-gap switches which are triggered at the same time, the bean shaped plasma belts containing the shock and ohmic heated electrons (1.24 keV and $5x10^{14}$ cm^{-3}) are all together pushed towards the center by the Lorentz force. The belts are combined with the helical electrons and the poloidal field vector of E-layers produced parallel to the current density vector. Thus, the current channel synthetized at the center (10 keV, 10-12 MA and $2.86x10^{18}$ cm^{-3}) is not massive such as in that of conventional Z-pinch. Furthermore, it is expected that in this channel translated into pinched regime, due to the toroidal and poloidal fields are interlinked, the growth rate of m=0 instability is reduced. Besides, the compression occurred at the center is adiabatic. (author). 9 refs, 6 figs.

14181 (INIS-RU–370) **Problems of nuclear science and technology: Scientific-technical collection.** Termoyadernyj sintez, no.3. Velikhov, E.P. (ed.). Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

Reliability and avoilability assessments for ITER tokamak are given. Problems of first wall - plasma interactions and thermonuclear reactor power control are considered. Problems of stability for a tandem mirror reactor are considered. Plasma heating in the ATF torsatron is considered too. Data on radiation-induced swelling and principles of alloying of thermonuclear reactor materials are presented.

14182 (INIS-RU–370, pp. 3-8) **Results of consideration of ITER conceptual design.** Sokolov, Yu.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The results of the national review of the ITER Conceptual Design taken place during February-March of 1991 are presented. The results of the review were discussed on the meeting at Kurchatov Institute. The main project objectives were confirmed and the initiation of the ITER Engineering Design Activity was recommended.

14183 (INIS-RU–370, pp. 18-24) **ITER fusion power control.** Vasil'ev, N.N.; Lukash, V.Eh.; Khajrutdinov, R.R. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The results of numerical analysis of static and dynamic thermal characteristics of the ITER reactor for the case when neutron power and auxiliary heating power are coupled by negative feedback, are given. The neutral atom beam injection and SHF electron cyclotron resonance heating are taken as the sources for auxiliary heating. 7 refs.; 11 figs.

14184 (INIS-RU–370, pp. 24-28) **Tritium accumulation in lithium-lead eutectic blanket for the ITER reactor.** Romanov, P.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

Tritium accumulation in lithium-lead eutectic blanket is considered for two regimes of ITER scenario. It is shown that the equilibrium tritium invertory in eutectic blanket could be less then 1 kg if a suitable parameters of tritium extraction system should be obtained. 6 refs.; 3 figs.; 2 tabs.

14185 (INIS-RU–370, pp. 28-33) **Quantitative analysis of reliability of thermonuclear power installations at early design phases.** Kolbasov, B.N.; Strebkov, Yu.S.; Shiverskij, E.A. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

General methodology principles and simplified algorithms for reliability and availability assessment of thermonuclear reactor systems are presented. A tube reliability Reference Table which is considered to be appropriate for the subject of interest is proposed. The Table was composed on the bases of worldwire nuclear piping reliability data analysis and expert ranging technique application. As an example, ITER first wall and blanket reliability assessments are presented. 10 refs.; 6 figs.; 4 tabs.

14186 (INIS-RU–370, pp. 34-36) **Estimate accuracy of ITER availability factor.** Danilin, V.G. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The possible methods for calculation of the ITER thermonuclear reactor availability factor are considered, and the formulae for estimation of this factor calculation accuracy are siggested. The formulae obtained give an apportunity to solve the following direct and inverse problems: to determine the accuracy of the plant availability factor estimation basing on the precision characteristics for reliability and reductibility indexes of its components; to formulate the requirements for estimation accuracy of the component reliability and reductibility indexes providing for the preset value of estimation accuracy for the plant availability factor. 5 refs.; 2 figs.; 1 tab.

14187 (INIS-RU–370, pp. 50-55) **Shaping of liquid metal flow with predetermined parameters in the tokamak magnetic field.** Vodyanyuk, V.O.; Dem'yanenko, V.N.; Kolesnichenko, A.F.; Murav'ev, E.V. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The results of calculational and experimental studies into shaping of the liquid hallium jet-droplet flows with predetermined parameters in a magnetic field related to the liquid metal divertor target of a tokamak reactor are given. The idea of using the tokamak toroidal field for liquid metal jet disturbance directly in the reactor chamber is proved. 4 refs.; 11 figs.

14188 (INIS-RU–370, pp. 59-64) **Analysis of dynamic stability for tandem mirror reactor D-^{3}He.** Ivankov, M.Yu. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii. 1991. 80p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94617517. Source: OSTI; NTIS (US Sales Only); INIS.

The problem of dynamic stability for tandem mirror reactor has been considered. The influence of plasma parameters on reactor dynamic stability has been studied by means of numerical simulation. Unstable regimes were revealed in the region of large plasma's β_p. The mechanismes of their appearing and growth

were investigated. Boundaries of stability for the tandem mirror system were determined. 8 refs.; 5 figs.

14189 (INIS-RU–374, pp. 20-36) **Main trends and some results of works dealing with studying construction materials for the ITER project.** Zavyal'skij, L.P. (and others); Kalinin, G.M.; Strebkov, Yu.S. Ministerstvo Rossijskoj Federatsii po Atomnoj Ehnergii, Moscow (Russian Federation); Nauchno-Issledovatel'skij i Konstruktorskij Inst. Ehnergotekhniki, Moscow (Russian Federation). 1992. 70p. (In Russian). In *Problems of nuclear science and technology: Scientific-technical collection.* Order Number DE94619627. Source: OSTI; NTIS (US Sales Only); INIS.

The main trends and status of studies for substantiation of construction materials selection for thermonuclear reactor elements are considered. The results of investigations of the materials for the blanket, first wall vacuum chamber being in contact with plasma, as well as those for cooling system, electric insulation and breeder ones are given. 20 refs., 2 tabs., 3 figs.

14190 (JAERI-M–92-207, pp. 229-236) **Materials research using a high energy intense neutron irradiation facility -ESNIT program.** Noda, Kenji (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sugimoto, Masayoshi; Kato, Yoshio. Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1992. (CONF-9202184–: 4. international symposium on advanced nuclear energy research, Mito (Japan), 5-7 Feb 1992; JAERI-CONF–1). In *Proceedings of the fourth international symposium on advanced nuclear energy research: Roles and direction of material science in nuclear technology.* 676p. Order Number DE93508339. Source: OSTI; NTIS; INIS.

A concept of high energy intense neutron irradiation facility named 'Energy Selective Neutron irradiation test Facility' (ESNIT) was conceived at Japan Atomic Energy Research Institute (JAERI) for researches and development (R and D) of advanced materials in generic nuclear applications including nuclear fusion applications as a main object. ESNIT is a neutron-irradiation-test facility utilizing d-Li stripping reactions, which is mainly featured by selectivity of neutron spectra, neutron flux level optimized from the stand points of materials irradiation tests and feasibility in technological and financial aspects, good accessibility to the irradiation cells and a modular-type post irradiation examination facility. Characteristics of neutron irradiation field and present status of ESNIT program are described in this paper. Furthermore, advantage and limitation of ESNIT, and materials research to be carried out using ESNIT are also defined for both fundamental and base materials research and fusion reactor materials R and D. (author).

14191 (JAERI-M–92-207, pp. 343-348) **Two ion accelerators-electron microscope link for the direct observation of dual-ion irradiation effects.** Hojou, Kiichi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Furuno, Shigemi; Otsu, Hitoshi; Sasaki, T.A.; Izui, Kazuhiko; Tsukamoto, Tetsuo. Japan Atomic Energy Research Inst., Tokyo (Japan). Dec 1992. (CONF-9202184–: 4. international symposium on advanced nuclear energy research, Mito (Japan), 5-7 Feb 1992; JAERI-CONF–1). In *Proceedings of the fourth international symposium on advanced nuclear energy research: Roles and direction of material science in nuclear technology.* 676p. Order Number DE93508339. Source: OSTI; NTIS; INIS.

An analytical 400 kV electron microscope of JEM-4000FX type has been combined with two sets of 40 kV ion accelerator in order to observe the dynamic effects of dual ion irradiation of materials. The electron microscope was equipped with electron energy loss spectrometer and an energy dispersive X-ray microanalyzer. Two ion guns are of duo-plasmatron type and have an accelerating voltage of 40 kV. The ion beam monitor is set at the outlet of the electrostatic prism, and the small Faraday cup with the 0.25 mm diameter is set at the specimen position on the specimen holder of side entry type. The flux of helium ion (He^+) at the specimen position is about $5x10^{18}$ atoms/m^2s for the case of 12 keV and that of hydrogen ion (H_2^+) is about $5x10^{18}$ atoms/m^2s for the case of 15 keV. The ion beam is very stable for several hours operation, and fluctuation is less than 5 % for one hour. Using this system hydrogen and helium dual-ion beam irradiation experiment was performed on SiC crystals. It was found that the dual-ion irradiation has the effects of suppressing bubbles formation in comparison with the case of the single helium ion irradiation. (author).

14192 (KFK–5192) **Proposal of a concept and reliability analysis for a fusion plant magnet protection system.** Schnauder, H. (Kernforschungszentrum Karlsruhe GmbH (KfK) (Germany). Inst. fuer Reaktorsicherheit (IRS)); Pamfilie, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Reaktorsicherheit; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Kernfusion. May 1993. 29p. Order Number DE94752409. Source: OSTI; NTIS (US Sales Only); INIS.

The unavailability for the current switch down in case of a demand in the magnet coils of a fusion demonstration plant must be decreased by a few orders of magnitude as compared to the one of experimental facilities. The safety requirements to prevent initiation of event sequences which might lead to the release of radioactivity and energy by the plant must be fulfilled with the same standards as applied in a normally applicable plant. On the basis of this proven technology a general usable magnet protection system will be proposed, which achieves some considerable improvements in the failure detectability as compared to the conventional protection systems. It will be demonstrated by fault tree analysis that the principal demands on safety can be satisfied by that approach. The improvements are achieved by the use of an additional microprocessor supported system for failure detection without being used for initiation of any safety related actions. An influence on a safety action by the additional system therefore is excluded. (orig.)

14193 (NIIEFA-P-B–0904) **Superconductor switches for protection and control of superconducting magnetic systems.** Akopyan, D.G.; Bursikov, A.S.; Mymrikov, V.V. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1992. 15p. (In Russian). Order Number DE94617257. Source: OSTI; NTIS (US Sales Only); INIS.

Designs are described of superconducting switches (SCS) and prepositions are formulated for their current-carrying capacity increasing and for decreasing energy consumption for control. Results of experimental investigations are described. The conclusion is made that together with superconducting magnetic systems SCS makes possible to develop a superconducting storage and to provide for the energy evacuation in an external load. 4 refs., 11 figs., 2 tabs.

14194 (NIIEFA-P-NILSA–0880) **Optimization calculations and parametric study on thermonuclear reactor on the base of pulse compact torus with reduced neutron yield.** Krivosheev, M.V. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1990. 11p. (In Russian). Order Number DE94617253. Source: OSTI; NTIS (US Sales Only); INIS.

Optimization calculations are performed using a simplified mathematic model and parametric investigations into the thermonuclear reactor on the base of pulse compact torus with D-^{3}He fuel are conducted. 10 refs.

14195 (ORNL/FTR–4860) **Travel to France to participate in the Tore Supra steering committee meeting: Foreign trip report, November 12, 1993–November 24, 1993.** Mioduszewski, P.K. Oak Ridge National Lab., TN (United States). 9 Dec 1993. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94004462. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The goal of the Tore Supra program is to develop steady state plasma operation under fusion-relevant conditions. The US fusion program participates in the Tore Supra program, since it is the only large steady-state tokamak project in the world. Status and plans of the US – Tore Supra Collaboration were discussed during the annual steering committee meeting which was held in Cadarache, France, on November 15 and 16, 1993. While the development of steady state plasma operation presents many new challenges, especially in the areas of heating and power and particle handling, the reported progress made during the past year is encouraging. In more detailed discussions, progress of the ORNL – Tore Supra collaboration on plasma boundary issues was discussed with Tore Supra staff members. ORNL is mostly providing data analysis and computer modeling of Tore Supra experimental results. This collaboration is working well, and Tore Supra staff and management

were very complimentary about the key contributions by ORNL scientists to the Tore Supra program.

14196 (UCRL-ID–116209) **Large plastic shells from our contract with the Lebedev Institute.** Cook, R.C. Lawrence Livermore National Lab., CA (United States). 2 Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008309. Source: OSTI; NTIS; GPO Dep.

We have a contract with the Department of Neutron Physics at the Lebedev Physical Institute in Moscow to develop the technology to produce plastic shells with diameters of about 2 mm that would be potentially suitable for NIF targets. They have recently delivered a selection of plastic shells with diameters of about 1 mm. The quality of these shells is in general quite good. The wall thicknesses range from about 4 to 7 μm. Sphericity looks excellent and wall thickness uniformity may be acceptable. Two shells were sphere-mapped. There are some problems at low modes. In addition there was a great deal of dust and debris from breakage during shipping. However these shells are probably better than any micro encapsulation shells of the same size. Some of the shells will be overcoated for cryogenic liquid layering experiments.

14197 (UCRL-JC–114262) **Assessment of a magnet system combining the advantages of cable-in-conduit forced-flow and pool-boiling magnets.** Slack, D.; Hassenzahl, W.; Felker, B.; Chaplin, M. Lawrence Livermore National Lab., CA (United States). 6 Oct 1993. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931018–82: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94006612. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an idea for a magnet system that could be used to advantage in tokamaks and other fusion engineering devices. Higher performance designs, specifically newer tokamaks such as those for the international Tokamak Engineering Reactor (ITER) and Tokamak Physics Experiment (TPX) use Cable in Conduit Conductor (CICC) forced flow coils to advantage to meet field and current density requirements. Pool boiling magnets lack structural integrity to resist high magnetic forces since helium cooling areas must surround each conductor. A second problem is that any leak can threaten the voltage standoff integrity of the magnet system. This is because a leak can result in low-pressure helium gas becoming trapped by limited conductance in the magnet bundle and low-pressure helium has poor dielectric strength. The system proposed here is basically a CICC system, with it's inherent advantages, but bathed in higher pressure supercritical helium to eliminate the leak and voltage break-down problems. Schemes to simplify helium coolant plumbing with the proposed system are discussed. A brief historical review of related magnet systems is included. The advantages and disadvantages of using higher pressure, supercritical helium in combination with solid electrical insulation in a CICC system are discussed. Related electrical data from some previous works are compiled and discussed.

14198 (UCRL-JC–114264) **Thermo-hydraulic analysis of the TPX superconducting TF magnets.** Wong, R.L.; Zbasnik, J.P.; Hassenzahl, W.V. Lawrence Livermore National Lab., CA (United States). 6 Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931018–80: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94006610. Source: OSTI; NTIS; INIS; GPO Dep.

The superconducting magnets in Fusion Reactors are subjected to pulsed, nuclear, and resistive heating. The thermo-hydraulic response of the helium forced-flow cooled conductors to the various heat sources is critical to magnet design and performance. Recently developed computer codes allow accurate modeling of conductor response and have been used as an aid to design of the toroidal field (TF) magnets for the Tokamak Physics eXperiment (TPX). The authors present results of design studies that determine the trade-off between double- and single-pancake helium-flow configurations.

14199 (UCRL-JC–114265) **Study on current sharing phenomena observed during the testing of ITER prototype cable-in-conduit conductors in the FENIX test facility.** Lee, Y.J. (ICF Kaiser Engineers, Inc., Oakland, CA (United States)); Wong, R.L.; Shen, S.S. Lawrence Livermore National Lab., CA (United States). 6 Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931018–85: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94007237. Source: OSTI; NTIS; GPO Dep.

Current sharing phenomena were studied during the testing of ITER (International Thermonuclear Experimental Reactor) prototype sample conductors in the FENIX (Fusion Engineering International Experiments) test facility at the Lawrence Livermore National Laboratory. During steady-state operation in the current sharing region, voltage drops of up to 200 μV were measured across the conductor. These experimental results were studied in detail using computer program CICC. Differences between the computer predictions and experimental results are postulated to be due to inter-strand cross-currents.

14200 (UCRL-JC–114266) **Structural design of the superconducting Poloidal Field coils for the Tokamak Physics Experiment.** O'Connor, T.G.; Zbasnik, J.P. Lawrence Livermore National Lab., CA (United States). 6 Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC02-76CH03073. (CONF-931018–84: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94007078. Source: OSTI; NTIS; INIS; GPO Dep.

The Tokamak Physics Experiment concept design uses superconducting coils made from cable-in-conduit conductor to accomplish both magnetic confinement and plasma initiation. The Poloidal Field (PF) magnet system is divided into two subsystems, the central solenoid and the outer ring coils, the latter is focus of this paper. The eddy current heating from the pulsed operation is excessive for a case type construction; therefore, a "no case" design has been chosen. This "no case" design uses the conductor conduit as the primary structure and the electrical insulation (fiberglass/epoxy wrap) as a structural adhesive. The model integrates electromagnetic analysis and structural analysis into the finite element code ANSYS to solve the problem. PF coil design is assessed by considering a variety of coil current wave forms, corresponding to various operating modes and conditions. The structural analysis shows that the outer ring coils are within the requirements of the fatigue life and fatigue crack growth requirements. The forces produced by the Toroidal Field coils on the PF coils have little effect on the maximum stresses in the PF coils. In addition in an effort to reduce the cost of the coils new elongated PF coils design was proposed which changes the aspect ratio of the outer ring coils to reduce the number of turns in the coils. The compressive stress in the outer ring coils is increased while the tensile stress is decreased.

14201 (UCRL-JC–114269) **The TPX magnet R&D program.** Zbasnik, J.P. (Lawrence Livermore National Lab., CA (United States)); Hassenzahl, W.V.; Chaplin, M.R.; Slack, D.S.; Lang, D.D.; Schultz, J.H.; Citrolo, J.C. Lawrence Livermore National Lab., CA (United States); Princeton Univ., NJ (United States). Plasma Physics Lab. 6 Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; AC02-76CH03073. (CONF-931018–81: Symposium on fusion engineering, Hyannis, MA (United States), 11-15 Oct 1993). Order Number DE94006609. Source: OSTI; NTIS; INIS; GPO Dep.

A unique feature of the magnet system for the Tokamak Physics Experiment (TPX) is that all the magnets are superconducting. With the exception of the outer poloidal coils, the magnet system uses Nb_3Sn cable-in-conduit conductor; the outer poloidal coils use Nb-Ti cable-in-conduit conductor. A Research and Development program is needed to ensure that the materials, processes, and systems are available to support the fabrication and operation of these magnets. The authors describe their plans for R&D in the areas of: conductor strand and sheath development, insulation materials and configuration, conductor forming, curing, and impregnation techniques, and quench detection methods and techniques. Since a significant portion of the TPX magnet system design and fabrication will be done in industry, a division of the magnet R&D effort between industry and the National Laboratories is proposed.

A close liaison is maintained with the ITER magnet R&D program, and TPX will make use of ITER results whenever possible.

14202 (UCRL-JC–114789) **The threshold energy for defect production in SiC: A molecular dynamic study.** Wong, J. (Lawrence Livermore National Lab., CA (United States)); Diaz de la Rubia, T.; Guinan, M.W.; Tobin, M.; Perlado, J.M.; Perez, A.S.; Sanz, J. Lawrence Livermore National Lab., CA (United States). 1 Oct 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-930928–28: 6. international conference on fusion reactor materials, Stresa (Italy), 27 Sep - 1 oct 1993). Order Number DE94007123. Source: OSTI; NTIS; INIS; GPO Dep.

We discuss the results of molecular dynamics computer simulation studies of the threshold energy for defect production in β-SiC. The simulations are performed with the Tersoff potential for SiC which provides accurate values of many of its defect properties. In addition, we show that it properly describes the melting behavior of SiC. Simulations were carried out for Si and C recoils in 3 dimensional cubic computational cells with periodic boundary conditions and up to 4096 atoms. The results show anisotropy in the threshold for Si and C recoils as well as for the recoil direction. The lowest threshold is 25 eV for C recoils along [111] and the highest is 85 eV for Si recoils along [110]. Details of the defect configurations obtained will be discussed.

14203 (UCRL-JC–114966) **Precision operation of the Nova laser for fusion experiments.** Caird, J.A. (and others); Ehrlich, R.B.; Hermes, G.L. Lawrence Livermore National Lab., CA (United States). Feb 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931048–7: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94007073. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. NEODYMIUM LASERS/operation; INERTIAL CONFINEMENT; NOVA FACILITY; OPERATION

14204 (UCRL-JC–114969) **A comparison of driver concepts for heavy-ion fusion.** Sharp, W.M. Lawrence Livermore National Lab., CA (United States). 10 Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931048–9: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94007239. Source: OSTI; NTIS; INIS; GPO Dep.

The indirect-drive targets being considered for inertial fusion require the driver to deposit around 5 MJ on a target in less than 10 ns. This requirement can in principle be met by heavy-ion beams with particle masses between 120 and 240 amu, an ion kinetic energy in the range of 6–12 GeV, and a total current in excess of 30 kA. Three strategies for generating beams with these parameters are currently being studied. European laboratories are investigating the use of low-current beams from a radio-frequency accelerator. To obtain the needed current density, these beams would be stacked and accumulated in storage rings and then directed simultaneously at the target. American researchers are developing high-current induction accelerators, and the two principal configurations under consideration are the linear driver and the "recirculator," in which ion pulses pass repeatedly through the same accelerator elements. The merits of the three approaches are compared, and key physics uncertainties in each are identified.

14205 (UCRL-JC–114997) **A historical perspective on fifteen years of laser damage thresholds at LLNL.** Rainer, F.; De Marco, F.P.; Staggs, M.C.; Kozlowski, M.R.; Atherton, L.J.; Sheehan, L.M. Lawrence Livermore National Lab., CA (United States). 21 Dec 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931054–10: 25. Boulder damage symposium: annual symposium on optical materials for high-power lasers, Boulder, CO (United States), 27-29 Oct 1993). Order Number DE94007930. Source: OSTI; NTIS; INIS; GPO Dep.

We have completed a fifteen year, referenced and documented compilation of more than 15,000 measurements of laser-induced damage thresholds (LIDT) conducted at the Lawrence Livermore National Laboratory (LLNL). These measurements cover the spectrum from 248 to 1064 nm with pulse durations ranging from < 1 ns to 65 ns and at pulse-repetition frequencies (PRF) from single shots to 6.3 kHz. We emphasize the changes in LIDTs during the past two years since we last summarized our database. We relate these results to earlier data concentrating on improvements in processing methods, materials, and conditioning techniques. In particular, we highlight the current status of anti-reflective (AR) coatings, high reflectors (HR), polarizers, and frequency-conversion crystals used primarily at 355 nm and 1064 nm.

14206 (UCRL-JC–114998) **Large-area conditioning of optics for high-power laser systems.** Sheehan, L.M.; Kozlowski, M.R.; Rainer, F.; Staggs, M.C. Lawrence Livermore National Lab., CA (United States). 21 Dec 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931054–8: 25. Boulder damage symposium: annual symposium on optical materials for high-power lasers, Boulder, CO (United States), 27-29 Oct 1993). Order Number DE94007028. Source: OSTI; NTIS; INIS; GPO Dep.

In order to reach the high fluence goals of the Beamlet laser at Lawrence Livermore National Laboratory (LLNL), the polarizers in the system must be laser conditioned to increase their damage thresholds. Research has shown that by using a six-step raster-conditioning program, the damage thresholds of the HfO_2/SiO_2 multilayer polarizer coatings can be increased to meet the Beamlet 3-ns design goal of 8 J/cm$_2$. Because of the large size of the polarizers (73 cm x 37 cm x 9 cm), a large-area conditioning facility was constructed capable of rastering a one-meter optic, weighing as much as 400 pounds, at any specified use angle. A large translational stage moves the optic in a raster pattern through a stationary, 10-Hz rep-rated, 1064-nm beam with 10-ns pulses. A scatter measurement diagnostic allows on-the-fly evaluation of laser-induced damage and logs the coordinates of the damage. Laser energy is measured pulse-to-pulse in order to ensure stability during a scan. A small amount of minor coating damage does occur during the process, but the damage does not grow upon further irradiation. This damage causes only a small increase in total scatter compared to that due to the preexisting defects, and would not influence the system performance.

14207 (UCRL-JC–115197) **The Edward Teller medal lecture: The evolution toward indirect Drive and two decades of progress toward ICF ignition and burn.** Lindl, J.D. Lawrence Livermore National Lab., CA (United States). Dec 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931048–8: 11. international workshop on laser interaction and related plasma phenomena, Monterey, CA (United States), 25-29 Oct 1993). Order Number DE94007243. Source: OSTI; NTIS; INIS; GPO Dep.

In 1972, I joined the Livermore ICF Theory and Target Design group led by John Nuckolls, shortly after publication of John's seminal Nature article on ICF. My primary role, working with others in the target design program including Mordy Rosen, Steve Haan, and Larry Suter, has been as a target designer and theorist who utilized the LASNEX code to perform numerical experiments, which along with analysis of laboratory and underground thermonuclear experiments allowed me to develop a series of models and physical insights which have been used to set the direction and priorities of the Livermore program. I have had the good fortune of working with an outstanding team of scientists who have established LLNL as the premier ICF laboratory in the world. John Emmett and the LLNL Laser Science team were responsible for developing a series of lasers from Janus to Nova which have given LLNL unequaled facilities. George Zimmerman and the LASNEX group developed the numerical models essential for projecting future performance and requirements as well as for designing and analyzing the experiments. Bill Kruer, Bruce Langdon and others in the plasma theory group developed the fundamental understanding of laser plasma interactions which have played such an important role in ICF. And a series of experiment program leaders including Mike Campbell and Joe Kilkenny and their laser experimental teams developed the experimental techniques and diagnostic capabilities which have allowed us to c increasingly complex and sophisticated experiments.

14208 (UCRL-JC–115500) **Inertial fusion with ultra-powerful lasers.** Tabak, M.; Hammer, J.; Glinsky, M.; Kruer, W.; Wilks, S.; Woodworth, J.; Campbell, E.M.; Perry, M.D.; Mason, R. Lawrence Livermore National Lab., CA (United States). Oct 1993. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931132–2: Fall meeting of the Plasma Physics Division of the American Physical Society, St. Louis, MO (United States), 1-5 Nov 1993). Order Number DE94007242. Source: OSTI; NTIS; INIS; GPO Dep.

Ultra-high intensity lasers can be used to ignite ICF capsules with a few tens of kilojoules of light and can lead to high gain with as little as 100 kilojoules of incident laser light. We propose a scheme with three phases. First, a capsule is imploded as in the conventional approach to inertial fusion to assemble a high density fuel configuration. Second, a hole is bored through capsule corona composed of ablated material, pushing critical density close to the high density core of the capsule, by employing the ponderomotive force associated with high intensity laser light. Finally, the fuel is ignited by suprathermal electrons, produced in the high intensity laser plasma interactions, which propagate from critical density to this high density core. This paper reviews two models of energy gain in ICF capsules and explains why ultra-high intensity lasers allow access to the model producing the higher gains. This new scheme also drastically reduces the difficulty of the implosion and thereby allows lower quality fabrication and less stringent beam quality and symmetry requirements from the implosion driver. The difficulty of the fusion scheme is transferred to the technological difficulty of producing the ultra-high-intensity laser and of transporting this energy to the fuel.

14209 (UCRL-JC–116080) **Progress in understanding and improving X-ray lasers.** Nilsen, J.; Moreno, J.C.; Koch, J.A.; Scofield, J.H.; MacGowan, B.J.; DaSilva, L.B. Lawrence Livermore National Lab., CA (United States). 11 Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931237–6: LASERS '93: international conference on lasers and applications, Lake Tahoe, NV (United States), 6-10 Dec 1993). Order Number DE94006048. Source: OSTI; NTIS; GPO Dep.

We discuss the use of a prepulse technique to achieve lasing in low-Z neon-like ions on the $3p \rightarrow 3s(J = 0 \rightarrow 1)$ transition. In neon-like titanium(Z=22), chromium(Z=24), iron(Z=26), nickel(Z=28), zinc(Z=30), and germanium(Z=32) this transition lases at 326, 285, 255, 231, 212 and 196 Å respectively. We present results using this technique on selenium(Z=34) and show how the $J = 0 \rightarrow 1$ transition at 182 Å suddenly becomes a strong line. The observation that the low-Z ions with odd Z have not lased lead us to investigate the potential impact of hyperfine splitting on the laser gain. In our experiments we measure the lineshape of the $3p \rightarrow 3s(J = 0 \rightarrow 1)$ transition in neon-like niobium and zirconium and observe a 28 mÅ splitting between the two largest hyperfine components in the niobium(Z=41) line at 145.9 in good agreement with theory. In zirconium(Z=40), no splitting is observed since the hyperfine effect is proportional to the nuclear moment, and the principal isotopes of zirconium have zero nuclear moment, as is typical for even-Z elements. Finally we discuss the use of low density foams for the laser target and present results which show lasing in zirconium aerogel with an initial density of 90 mg/cm^3.

14210 (UCRL-LR–105820-88/89) **ICF program annual report, 1988–89.** Lawrence Livermore National Lab., CA (United States). Sep 1993. 655p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008281. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains discussions on the following topics: Target Physics; Nova Experiments; Nova Laser Science and Technology; Target Science and Technology; Advanced Drivers; and ICF Applications.

99 GENERAL AND MISCELLANEOUS

9901 Management

Refer also to citation(s) 11818, 12298, 12869, 13305, 14261

14211 (DOE/CE/90053–T62) **Interagency Advanced Power Group – Steering group meeting minutes.** Horizon Data Corp., Reston, VA (United States). Power Information Center. 18 Nov 1993. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-90CE90053. Order Number DE94007951. Source: OSTI; NTIS; GPO Dep.

This document contains the draft meeting minutes of the Steering Group of the Interagency Advanced Power Group. Included are the discussions resulting from the presentation of working group reports and the results of a discussion of IAPG policies and procedures. In the appendix are the reports of the following working groups: Electrical, Mechanical, Solar, and Systems.

14212 (DOE/HR–0066) **Total quality management implementation guidelines.** USDOE, Washington, DC (United States). Dec 1993. 73p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007232. Source: OSTI; NTIS; GPO Dep.

These Guidelines were designed by the Energy Quality Council to help managers and supervisors in the Department of Energy Complex bring Total Quality Management to their organizations. Because the Department is composed of a rich mixture of diverse organizations, each with its own distinctive culture and quality history, these Guidelines are intended to be adapted by users to meet the particular needs of their organizations. For example, for organizations that are well along on their quality journeys and may already have achieved quality results, these Guidelines will provide a consistent methodology and terminology reference to foster their alignment with the overall Energy quality initiative. For organizations that are just beginning their quality journeys, these Guidelines will serve as a startup manual on quality principles applied in the Energy context.

14213 (DOE/IG–0002/93) **Office of Inspector General semiannual report to Congress, April 1–September 30, 1993.** USDOE Office of Inspector General, Washington, DC (United States). 29 Oct 1993. 82p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

Report to The Secretary.

This Office of Inspector General Semiannual Report to the Congress covers the period from April 1 through September 30, 1993. The report summarizes significant audit, inspection and investigative accomplishments for the reporting period, a large portion of which evaluated management controls that the Department of Energy uses to ensure efficient and effective operation of its programs. During this reporting period, the Office of Inspector General issued 67 audit and 6 inspection reports. As a result of reviews of contract costs, the Office of Inspector General determined that $3.7 million in costs were either questionable or unsupported. Management committed to taking corrective actions which the Office of Inspector General estimates will result in a more efficient use of funds totaling $32.6 million. For reports issued during the period, the Office of Inspector General made recommendations that, when implemented by management, could result in $38.6 million being put to better use. The Office of Inspector General's investigations led to 8 criminal convictions, 39 case referrals to management for corrective action, and 17 administrative disciplinary actions. The investigations resulted in fines and recoveries of $2,572,627.

14214 (DOE/IG–0003) **FY 1994 Annual Work Plan.** USDOE Office of Inspector General, Washington, DC (United States). 1 Oct 1993. 84p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

This is the third Office of Inspector General (OIG)Annual Work Plan. Its purpose is to summarize work completed in Fiscal Year (FY) 1993, identify ongoing projects from previous fiscal years which the OIG intends to continue into FY 1994, and announce planned projects which the OIG intends to begin in FY 1994.

14215 (DOE/IG–0010/10) **FY 1994 Annual Work Plan.** USDOE Office of Inspector General, Washington, DC (United States). Office of Assistant Inspector General for Audits. 30 Sep 1993. 55p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

In accordance with the Inspector General's Strategic Planning Policy directive, the Office of Inspector General (OIG) annually updates its Strategic Plan with budgetary and program guidance for the next fiscal year. The program guidance identifies and establishes priorities for OIG coverage of important DOE issues and operations, provides the basis for assigning OIG resources, and is the source for issues covered in Assistant Inspectors General annual work plans. The Office of the Assistant Inspector General for Audits (AIGA) publishes an Annual Work Plan in September of each year. The plan includes the OIG program guidance and shows the commitment of resources necessary to accomplish the assigned work and meet our goals. The program guidance provides the framework within which the AIGA work will be planned and accomplished. Audits included in this plan are designed to help insure that the requirements of our stakeholders have been considered and blended into a well balanced audit program.

14216 (DOE/IG–0335) **Inspection of selected intelligence and special access program work-for-others projects.** USDOE Office of Inspector General, Washington, DC (United States). Office of Inspections. 8 Oct 1993. 77p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

Report to The Secretary.

At the request of the former Secretary, an inspection of six classified intelligence and special access program work-for-others projects was conducted. The purpose of this inspection was to evaluate managements, effectiveness regarding these work-for-others projects and included tests for financial integrity and adherence to applicable laws and regulations. Details of the inspection are provided in this report.

14217 (DOE/IG–0339) **Report on audit of implementation of the Accountability Rule.** USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office. 21 Jan 1994. 33p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

Report to The Secretary.

In 1991, DOE procurement regulations were revised to help contractors improve their performance in operating and managing DOE facilities; the accountability and liability of contractors were increased, and opportunity was provided for earning increased fees. The audit showed that DOE had spent $25.3 M in FY 1992 to implement the accountability rule with no conclusive evidence that the accountability rule was achieving its objectives. For 5 contracts, DOE had spent $22.8 M in increased contract fees and $2.5 M in administrative costs (an additional $4 M paid to adjust for inflation) without any appreciable improvements in contractor performance. Furthermore, the contract costs disallowed and recovered under the accountability rule were insignificant. Prime cause was that DOE had not fully evaluated the potential costs and benefits of the accountability rule prior to implementation. The audit also disclosed a number of issues that need to be resolved. The management agreed to conduct the recommended cost-benefit analysis, but it did not agree to suspend further application of the accountability rule until a basis is developed for measuring its benefits.

14218 (DOE/IG–0340) **Audit of staffing requirements at the Westinghouse Savannah River Company.** USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office. 25 Jan 1994. 43p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

Report to The Secretary.

The Westinghouse Savannah River Company operates the Savannah River Site for the US Department of Energy (Department) under a cost-plus-award-fee contract. Department policies require contractors to ensure a high level of performance in operating Department facilities by establishing operating standards, assessing performance against such standards, and holding contractor employees accountable for their performance. The purpose of the audit was to review Westinghouse's policies and practices for determining staffing requirements. Since assuming responsibility for the Savannah River Site in 1989, Westinghouse increased its staffing by over 4,000 employees. The Department had undertaken some actions to reduce the number of contractor employees at the Savannah River Site. Our audit showed that the use of industry and federal performance work standards in its construction and management activities could enable Westinghouse to further reduce its staff by over 1,800 employees. The potential savings in salaries and benefits associated with such action could be about $399 million over a 5-year period. Additional staffing reductions could be attained through the use of engineered time standards in the maintenance and fabrication shops. In addition, Westinghouse significantly understated, in periodic reports to the Department, the personnel resources applied to accomplish contract requirements. Of course, the actual staffing reductions realized would be largely determined by the manner in which the work standards are implemented and the levels of proficiency attained by the workforce.

14219 (FZR–92-15) **Rossendorf Research Center, Institute of Safety Research. Annual report 1991.** Boehmert, J. (ed.); Weiss, F.P. (ed.). Forschungszentrum Rossendorf e.V. (FZR) (Germany). Inst. fuer Sicherheitsforschung. Aug 1992. 149p. (In German). Order Number DE94745993. Source: OSTI; NTIS (US Sales Only); INIS.

The working program covers above all topics concerning the assessment of design basis safety and the increase of operational safety of the WWER type reactors. The topics are directed to the WWER-440/213 type and to the WWER-1000 type, and are dealt with by the three departments, i.e. incident analysis, neutron embrittlement, and mechanical integrity. One paper is concerned with the determination of the neutron field of HERA. (orig.)

14220 (IAEA-TECDOC–715) **International Centre for Theoretical Physics, Trieste, scientific activities in 1992.** International Atomic Energy Agency, Vienna (Austria). Aug 1993. 134p. Order Number DE94616606. Source: OSTI; NTIS (US Sales Only); INIS.

The document contains three parts. Part I is a programme overview of 1992 including a description of scientific activities and statistics about participation by geographic areas and by activities. Part II presents the scientific programme in the following fields: fundamental physics, condensed matter physics, mathematics, physics related to the energy problems, physics and the environment, physics of the living state (of matter), and applied physics. Conferences and other activities by the centre are also listed. Part III lists the publications issued in 1992. 5 tabs.

14221 (INIS-GB–522) **Report and accounts 1992-1993.** Nuclear Electric plc, Barnwood (United Kingdom). 1993. 64p. Order Number DE94618345. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear Electric's report and accounts for 1992-3 show that the electricity it supplied went up by 14%, sales were up by 22%, operating profit was up by 37%, productivity was up by 23% and operating cost was down by 11% compared with the previous year. Following the Chairman's statement, the Chief Executive's report summarises the year under the headings: electricity sales, operations, suppliers, construction, decommissioning, safety, environment, staff training and development, public relations, international relations and the future. Nuclear Electric's performance is summarised in key areas of its activities since its formation. The report concludes with the Director's report and the accounts. (UK).

14222 (INIS-GB–558) **Report on safety and the environment 1992-93.** AEA Technology, Harwell (United Kingdom). Sep 1993. 18p. Order Number DE94616607. Source: OSTI; NTIS (US Sales Only); INIS.

The steps taken by AEA Technology to implement high safety and environmental standards and performance levels achieved are summarized. AEA's policy on safety and the environment is stated. The way that safety is organised, how plant safety cases are made, plant operations and safety 1992-93 and decommissioning work at several of AEA's plants are reported. Radiological doses for AEA plants are shown to have fallen since 1990. General industrial and office safety, what is learned from accidents and incidents, how the environment is protected, the occupational health services provided and the emergency arrangements in operation are also mentioned briefly. (UK).

14223 (NKS–93-9) **The Nordic programme for nuclear safety 1990 - 1993: Status report for the first half-year 1993.** Nordisk Kernesikkerhedsforskning, Roskilde (Denmark). Aug 1993. 45p. (In English, Swedish, Norwegian). Order Number DE94618346. Source: OSTI; NTIS; INIS.

The report contains summaries written by leaders of the various projects carried out under the Nordic programme for nuclear safety during the first half-year of 1993. The programme covers spreading prognoses and consequences, strategy and methods for management and exchange of data for decision-makers, the evaluation and harmonizing of countermeasures and use of intervention levels, the basis for public information, Nordic emergency exercises, the re-establishment of radioactive contaminated areas, criteria for classification of radioactive materials, decommissioning of uranium-cleaning plants, storage of information, removal and disposal of contaminated soil from fields, influence of climatological and geological processes on longterm storage of radioactive wastes, training, quality assurance, aquatic radioecology, agriculture's radioecology, natural and semi-natural terrestrial ecosystems, reactor safety and personnel preparedness, safety evaluation, severe accidents and design and safety features of nuclear installations in countries which are neighbours to the Nordic lands. Budgets of expenditures for the various project groups are presented. (AB).

14224 (ORNL–6788) **Recommendations for improvements to program and project management.** Oak Ridge National Lab., TN (United States). Jan 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94007409. Source: OSTI; NTIS; GPO Dep.

Oak Ridge National Laboratory (ORNL) has operated with a balanced matrix organization for over sixteen years. Much of the work at the Laboratory is accomplished with good customer satisfaction through programs, projects, and matrix management. During the past several years concerns about program and project management at ORNL have been expressed by both the Department of Energy and ORNL staff. In May 1993 the ORNL Division/Program/Office Directors Caucus chartered a "fox team" to identity and to recommend improvements to matrix management that would lead to resolution of these concerns. Nine experienced ORNL staff members served on this Matrix Management Upgrade Solutions Team (MMUST). The MMUST adopted a four-phase approach in which they first gathered information and then developed and proposed recommended actions. In the fourth phase the team was available to support implementation of the recommendations. They began work in June 1993, gathering and evaluating information in biweekly meetings for six months. Recommendations developed in October and November 1993 were presented to ORNL management in December. The MMUST issued three principal recommendations based on their evaluation of the information gathered. They are: Renew and enhance the ORNL management commitment to matrix management, program managers, and project managers; Implement actions to ensure career path parity between the program/project manager family of positions and the technical line manager family of positions across all directorates and divisions; and Clarify and document program/project manager roles, responsibilities, and authorities.

14225 (PNL-SA–23192) **Workforce planning for reconfiguration and downsizing.** Stahlman, E.J.; Lewis, R.E.; Ross, T.L. Pacific Northwest Lab., Richland, WA (United States). Nov 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9311146–1: TIMS/ORSA joint national meeting, Phoenix, AZ (United States), 1-3 Nov 1993). Order Number DE94004772. Source: OSTI; NTIS; GPO Dep.

The Pacific Northwest Laboratory was tasked by the Department of Energy Albuquerque Field Office (DOE-AL) to develop a workforce assessment and transition planning tool to support integrated decision making at a single DOE installation. The planning tool permits coordinated, integrated workforce planning to manage growth, decline, or transition within a DOE installation. The tool enhances the links and provides commonality between strategic, programmatic, and operations planners and human resources. Successful development and subsequent scent complex-wide implementation of the model also will facilitate planning at the national level by enforcing a consistent format on data that are now collected by installations in corporate-specific formats that are not amenable to national-level analyses. The workforce assessment and transition planning tool consists of two components: the Workforce Transition Model and the Workforce Budget Constraint Model. The Workforce Transition Model, the preponderant of the two, assists decision makers identify and evaluate alternatives for transitioning the current workforce to meet the skills required to support projected workforce requirements. The Workforce Budget Constraint Model helps estimate the number of personnel that will be effected by a given a workforce budget increase or decrease and assists in identifying how the corresponding hirings or layoffs should be distributed across the COCS occupations.

14226 (SAND–93-4085) **Purchasing and Materials Management Organization, Sandia National Laboratories annual report, fiscal year 1993.** Martin, D.R. Sandia National Labs., Albuquerque, NM (United States). Feb 1994. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007843. Source: OSTI; NTIS; GPO Dep.

This report summarizes the purchasing and transportation activities of the Purchasing and Materials Management Organization for Fiscal Year 1993. Activities for both the New Mexico and California locations are included.

14227 (UCRL-JC–115706) **A facilitated mentoring process for engineers.** Donald, L.; Clark, M. Lawrence Livermore National Lab., CA (United States). Nov 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940467–2: 8. IEEE-USA careers conference, Dallas, TX (United States), 14-15 Apr 1994). Order Number DE94005823. Source: OSTI; NTIS; GPO Dep.

Mentoring has been occurring in organizations for many, many years through a natural pairing process of people wanting to help one another. The numerous benefits of mentoring to both the protege and the mentor are widely known. In this paper we describe a Facilitated Mentoring Pilot Program for engineers, successfully completed in June, 1993. This career development tool can help make "Every Engineer a Leader."

14228 (UTTAC–60) **Annual report of the Tandem Accelerator Center, University of Tsukuba: April 1, 1992 - March 31, 1993.** Tsukuba Univ., Ibaraki (Japan). Tandem Accelerator Center. Oct 1993. 136p. Order Number DE94748687. Source: OSTI; NTIS; INIS.

This annual report includes the research activities and the technical developments carried out at the Tandem Accelerator Center in University of Tsukuba for the period from April 1992 to March 1993. New experimental investigations were made on (1) nuclear spectroscopy was initiated by a new γ ray spectrometer; (2) polarization phenomena in nuclear reactions; (3) the application of energetic heavy ions to solid state physics; (4) the behavior of self interstitial atoms and its migration mechanism in Mo metal (5) the studies on electronic conduction of metal oxides and bronzes by NMR; (6) Moessbauer studies on Fe-Cr alloy and the RBS analysis of YBCO superconductor films; and (7) a new field was challenged on the micro cluster physics. Nuclear collective motion and the relativistic mean-field theory is also included in this report. (J.P.N.).

14229 (WHC-SA–2050) **Agile total quality guidelines for enhancing teamwork and success.** Brayton, D.D.; Harris, R.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940538–1: 48. annual quality congress, Las Vegas, NV (United States), 24-26 May 1994). Order Number DE93019972. Source: OSTI; NTIS; GPO Dep.

Companies implement total quality Programs to enable them to obtain performance leadership in meeting their business objectives. The successful corporations reach energy level of the corporate structure and change the overall culture of their operations. Limited success occurs when companies advocate total quality programs (e.g., high-powered training classes, tools and gimmicks), but are only partially effective in changing the culture of the work force. The ability to reach the "grassroots" level employees with a total quality program effort is vital in changing the overall culture. First-line management, i.e., both project and supervisory leaders, must direct the total quality program effort. First-line management needs well defined guidelines (beyond the general company guidelines) for implementing a total quality program. Guidelines that allow the establishment of an agile total quality Program, which support upper management total quality program directives, yet are modifiable

for their specific needs. The guidelines presented in this paper empower employees and improve the culture of the work environment through defined goals and teamwork to achieve success.

14230 (WHC-SA–2194) **Using Gagne's Chain in OJT.** Fetters, F.E. Westinghouse Hanford Co., Richland, WA (United States). Nov 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-931188–1: 17. annual training resources and data exchange conference: integrating training requirements and expectations, Indianapolis, IN (United States), 15-17 Nov 1993). Order Number DE94004826. Source: OSTI; NTIS; GPO Dep.

This report discusses Gagne's Chain which is a taxonomy which can used as a tool to identify trainee deficiencies encountered during On-the-Job Training. It also assists in the development of effective training strategies for the training of deficient behaviors and knowledges. Gagne's Chain presupposes three phases of acquisition for knowledges and skills identified as deficiencies: precondition, qualified acquisition, and unassisted demonstration. The hierarchy of the taxonomy identifies both the psychomotor and cognitive branches. At the "Principles" level, verbal and psychomotor activities are combined. Gagne's Chain identifies the hierarchy as follows: Problem Solving [higher psychomotor and verbal combined level], Principles (lower psychomotor and verbal combined level), Association [highest verbal level], Discrimination [second highest verbal level], Signal Recognition [lowest verbal level], Operant Chain [higher psychomotor level], and Single Operant [lower psychomotor level]. A "rule of thumb" associated with the use of Gagne's Chain is, if behavior or knowledge are not acquired at a higher level, the trainee should be trained at the next lower step. Then the knowledge or behavior acquired at this step becomes the precondition for the acquisition of the actual knowledge or skill identified at the original level.

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Refer also to citation(s) 11510, 11556, 11622, 11721, 11742, 11755, 11762, 11771, 11778, 11922, 11923, 11925, 11926, 11927, 11928, 11930, 11932, 11956, 12119, 12151, 12153, 12169, 12170, 12179, 12182, 12186, 12246, 12258, 12271, 12277, 12279, 12282, 12283, 12316, 12408, 12423, 12424, 12425, 12471, 12498, 12562, 12714, 12730, 12751, 12752, 12759, 12773, 12774, 12778, 12819, 12917, 12956, 12998, 12999, 13007, 13022, 13025, 13026, 13033, 13052, 13060, 13070, 13071, 13109, 13136, 13152, 13192, 13234, 13326, 13330, 13340, 13785, 13810, 13811, 13812, 13814, 13816, 13817, 13823, 13824, 13825, 13826, 13833, 13869, 13886, 14068, 14145, 14154, 14277

14231 (ANL–94/6) **OTTER 3.0 reference manual and guide.** McCune, W.W. Argonne National Lab., IL (United States). Jan 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94007457. Source: OSTI; NTIS; GPO Dep.

OTTER (Organized Techniques for Theorem-proving and Effective Research) is a resolution-style theorem-proving program for first-order logic with equality. OTTER includes the inference rules binary resolution, hyperresolution, UR-resolution, and binary paramodulation. Some of its other abilities and features are conversion from first-order formulas to clauses, forward and back subsumption, factoring, weighting, answer literals, term ordering, forward and back demodulation, evaluable functions and predicates, and Knuth-Bendix completion. OTTER is coded in C, is free, and is portable to many different kinds of computer.

14232 (ANL/EAIS/PP–75667) **Solution of mathematical programming formulations of subgame perfect equilibrium problems.** Macal, C.M. (Argonne National Lab., IL (United States)); Hurter, A.P. Argonne National Lab., IL (United States). 12 Feb 1992. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008489. Source: OSTI; NTIS; GPO Dep.

Mathematical programming models have been developed to represent imperfectly competitive (oligopolistic) market structures and the interdependencies of decision-making units in establishing prices and production levels. The solution of these models represents an economic equilibrium. A subgame perfect equilibrium formulation explicitly considers that each agent's strategies depend on the current state of the system; the state depends solely on previous decisions made by the economic agents. The structure of an industry-wide model that is formulated as a subgame perfect equilibrium problem is a matrix of simultaneous mathematical programming problems, where the rows represent time periods and the columns represent agents. This paper formally defines the subgame perfect equilibrium problem that includes mathematical programs for agent decision problems, and it characterizes the feasible space in a way that is conducive to the solution of the problem. The existence of equilibrium solutions on convex subspaces of the feasible region is proved, and this set is shown to contain the subgame perfect equilibrium solutions. A procedure for computing equilibrium solutions and systematically searching the subspaces is illustrated by a numerical example.

14233 (ANL/ECT/CP–82125) **Gigabits to the Desktop: Installing tomorrow's networks today.** Kuhfuss, T.C.; Phillips, P.T. Argonne National Lab., IL (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940377–1: International conference on advanced science and technology, Naperville, IL (United States), 1 Mar 1994). Order Number DE94007701. Source: OSTI; NTIS; GPO Dep.

Argonne is one of the US Department of Energy's world class research institutions. Leading edge computing tools and networks allow Argonne to maintain and enhance this reputation. One current effort to deploy leading edge tools is the Argonne "Gigabits to the Desktop" project. While the delivering and using gigabits to the desktop is little more than a hope at this time, this paper will discuss the hurdles to achieving it and how to tear down as many hurdles as possible. Under this project, four distinct areas are being investigated and enhanced. This paper will discuss briefly the applications and tools that we see driving the requirement for gigabits to the desktop. It will touch on a functional description of our"ideal" workstations, architectures and the candidates for the next generation network capable of delivering gigabits. Lastly, it will provide an in-depth analysis of physical layer options and attempt to prove that this area, while the least risky, must be done properly, with the proper media. This paper assumes one important point. It assumes that bandwidth is essentially free. We will discuss network architectures and physical installation recommendations which have a fixed cost. However on a campus, there is no marginal cost for additional packets on these networks once the network infrastructure is installed. This point is important when extrapolating our conclusions to the wide area. The marginal cost of a packet sent to a commercial network is usually non zero. This fact may prove to be a great hindrance in migrating the applications mentioned beyond the organizational boundaries.

14234 (ANL/IFR/CP–80791) **Design of graphic screens using Neuro Linguistic Programming.** Brown-VanHoozer, S.A. Argonne National Lab., Idaho Falls, ID (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940456–11: 1994 Society for Computer Simulation multiconference, San Diego, CA (United States), 11-15 Apr 1994). Order Number DE94007634. Source: OSTI; NTIS; GPO Dep.

Neuro Linguistic Programming (NLP) is an explicit and powerful model of human experience and communication which can be instrumental in designing pragmatic visual displays. It is a new approach to interacting with humans, based on modeling and outcomes. The original creators of NLP studied people who were successful in outcomes with their patients and modeled what these people did. Over sixteen years, the technique has crossed over into law, politics, business and education. The intended use that is described in this paper is focused on the human factor aspect and visual display designs.

14235 (ANL/IPD/CP–81274) **Moving BASISplus and TECHLIBplus from VAX/VMS to UNIX.** Dominiak, R. Argonne National Lab., IL (United States). [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38.

(CONF-9311152–1: 1993 annual Information Dimensions Exchange Association meeting, San Diego, CA (United States), 15-19 Nov 1993). Order Number DE94004696. Source: OSTI; NTIS; GPO Dep.

BASISplus is used at the Laboratory by the Technical Information Services (TIS) Department which is part of the Information and Publishing Division at ARGONNE. TIS operates the Argonne Information Management System (AIM). The AIM System consists of the ANL Libraries On-Line Database (a TECHLIBplus database), the Current Journals Database (IDI's current contents search), the ANL Publications Tracking Database (a TECHLIBplus database), the Powder Diffraction File Database, and several CD-ROM databases available through a Novell network. The AIM System is available from the desktop of ANL staff through modem and network connections, as well as from the 10 science libraries at ARGONNE. TIS has been a BASISplus and TECHLIBplus site from the start, and never migrated from BASIS K. The decision to migrate from the VAX/VMS platform to a UNIX platform. Migrating a product from one platform to another involves many decisions and considerations. These justifications, decisions, and considerations are explored in this report.

14236 (ANL/MCS/CP–81883) **A survey of numerical cubature over triangles.** Lyness, J.N.; Cools, R. Argonne National Lab., IL (United States). [1993]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9308116–1: Joint meeting of the Canadian Mathematical Society, the American Mathematical Society, and the Mathematical Association of America on computation 1943-1993, Vancouver (Canada), 15-19 Aug 1993). Order Number DE94006810. Source: OSTI; NTIS; GPO Dep.

This survey collects together theoretical results in the area of numerical cubature over triangles and is a vehicle for a current bibliography. We treat first the theory relating to regular integrands and then the corresponding theory for singular integrands with emphasis on the "full corner singularity." Within these two sections we treat successively approaches based on transforming the triangle into a square, formulas based on polynomial moment fitting, and extrapolation techniques. Within each category we quote key theoretical results without proof, and relate other results and references to these. Nearly all the references we have found may be readily placed in one of these categories. This survey is theoretical in character and does not include recent work in adaptive and automatic integration.

14237 (ANL/MCS/CP–81897) **Finite-part integrals and the Euler-Maclaurin expansion.** Lyness, J.N. Argonne National Lab., IL (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-931249–1: International symposium on special functions, approximation, numericqal quadrature, and orthogonal polynomials, West Lafayette, IN (United States), 2-4 Dec 1993). Order Number DE94006539. Source: OSTI; NTIS; GPO Dep.

The context of this note in the discretization error made by the m-panel trapezoidal rule when the integrand has an algebraic singularity at one end, say x = 0, of the finite integration interval. In the absence of a singularity, this error in described by the classical Euler-Maclaurin summation formula, which is an asymptotic expansion in inverse integer powers of m. When an integrable singularity (x^{α} with $\alpha > -1$) in present, Navot's generalization is valid. This introduces negative fractional powers of m into the expansion. Ninham has generalized this result to noninteger α satisfying $\alpha < -1$. In this note, we extend these results to all α by providing the nontrivial extension to negative integer α. This expansion differs from the previous expansions by the introduction of a term log m.

14238 (ANL/MCS/PP–73012) **Robust incremental condition estimation.** Bischof, C.H.; Tang, P.T.P. Argonne National Lab., IL (United States). 29 Mar 1991. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008128. Source: OSTI; NTIS; GPO Dep.

This paper presents an improved version of incremental condition estimation, a technique for tracking the extremal singular values of a triangular matrix as it is being constructed one column at a time. We present a new motivation for this estimation technique using orthogonal projections. The paper focuses on an implementation of this estimation scheme in an accurate and consistent fashion. In particular, we address the subtle numerical issues arising in the computation of the eigensystem of a symmetric rank-one perturbed diagonal 2 x 2 matrix. Experimental results show that the resulting scheme does a good job in estimating the extremal singular values of triangular matrices, independent of matrix size and matrix condition number, and that it performs qualitatively in the same fashion as some of the commonly used nonincremental condition estimation schemes.

14239 (ANL/MCS/PP–75914) **Information hiding in parallel programs.** Foster, I. Argonne National Lab., IL (United States). 30 Jan 1992. 29p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract NSF CCR-8809615. Order Number DE94008127. Source: OSTI; NTIS; GPO Dep.

A fundamental principle in program design is to isolate difficult or changeable design decisions. Application of this principle to parallel programs requires identification of decisions that are difficult or subject to change, and the development of techniques for hiding these decisions. We experiment with three complex applications, and identify mapping, communication, and scheduling as areas in which decisions are particularly problematic. We develop computational abstractions that hide such decisions, and show that these abstractions can be used to develop elegant solutions to programming problems. In particular, they allow us to encode common structures, such as transforms, reductions, and meshes, as software cells and templates that can reused in different applications. An important characteristic of these structures is that they do not incorporate mapping, communication, or scheduling decisions: these aspects of the design are specified separately, when composing existing structures to form applications. This separation of concerns allows the same cells and templates to be reused in different contexts.

14240 (ANL/MCS/PP–76764) **A globally and superlinearly convergent potential reduction interior point method for convex programming.** Monteiro, R.D. (Arizona Univ., Tucson, AZ (United States). Dept. of Systems and Industrial Engineering); Wright, S.J. Argonne National Lab., IL (United States). 15 Jul 1992. 34p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant DDM-9109404. Order Number DE94008125. Source: OSTI; NTIS; GPO Dep.

We consider an interior point algorithm for convex programming in which the steps are generated by using a primal-dual affine scaling technique. A "local" variant of the algorithm is shown to have superlinearly convergence with q-order up to (but not inducting) 2. The technique is embedded in a potential reduction algorithm and the resulting method is shown to be globally and superlinearly convergent. An important feature of the convergence analysis is its use of a novel strict interiority condition, which generalizes the usual conical neighborhood of the central path.

14241 (DOE/EIA–M055) **Propane Market Model documentation report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Dec 1993. 38p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007964. Source: OSTI; NTIS; GPO Dep.

The purpose of this report is to define the objectives of the Propane Market Model (PMM), describe its basic approach, and to provide details on model functions. This report is intended as a reference document for model analysts, users, and the general public. Documentation of the model is in accordance with EIA's legal obligation to provide adequate documentation in support of its models. The PMM performs a short-term (6- to 9-months) forecast of demand and price for consumer-grad propane in the national US market; it also calculates the end-of-month stock level during the term of the forecast. Another part of the model allows for short-term demand forecasts for certain individual Petroleum Administration for Defense (PAD) districts. The model is used to analyze market behavior assumptions or shocks and to determine the effect on market price, demand, and stock level.

14242 (DOE/EIA–M056) **Distillate Market Model documentation report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Dec 1993. 24p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94007965. Source: OSTI; NTIS; GPO Dep.

The purpose of this report is to define the objectives of the Distillate Market Model (DMM), describe its basic approach, and to provide details on model functions. This report is intended as a reference document for model analysts, users, and the general public. Documentation of the model is in accordance with EIA's legal obligation to provide adequate documentation in support of its models. The DMM performs a short-term (6- to 9-month) forecast of demand and retail price for distillate fuel oil in the national US market; it also calculates the end-of-month stock level during the term of the forecast. The model is used to analyze certain market behavior assumptions or shocks and to determine the effect on retail market price, demand, and stock level.

14243 (DOE/FTR–94004497) **Travel to Sweden to participate as a Principal Member of the ATM Forum: Foreign trip report, 14 November 1993–21 November 1993.** Hutchins, J.A. Sandia National Labs., Albuquerque, NM (United States). 20 Dec 1993. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94004497. Source: OSTI; NTIS (US Sales Only); GPO Dep.

(ATM stands for Asynchronous Transfer Mode, a high-speed computer networking standard). The ATM forum is chartered with creating interface standards for ATM and meets every other month to vote on proposed changes; the membership has grown to include many European companies and meets twice a year in Europe. ATM forum is progressing towards their goal of defining a workable standard for use of tomorrow's ATM networks. Many areas of concern were addressed. The LAN Emulation subgroup has begun work. Sandia presented "Simulation Results of TCP Performance Over ATM with and without Flow Control," to the Traffic Management subgroup. An alternative was voted to replace the Email document distribution system.

14244 (ENEA-RT-INN–93-16) **ROBERT autonomous navigation robot with artificial vision.** Cipollini, A. (ENEA, Casaccia (Italy)); Meo, G.B.; Nanni, V.; Rossi, L.; Taraglio, S.; Ferjancic, C. No corporate text available. 1993. 46p. (In Italian). (RT/INN–93-16). Order Number DE94752545. Source: OSTI; NTIS (US Sales Only).

This work, a joint research between ENEA (the Italian National Agency for Energy, New Technologies and the Environment) and DIGITAL, presents the layout of the ROBERT project, ROBot with Environmental Recognizing Tools, under development in ENEA laboratories. This project aims at the development of an autonomous mobile vehicle able to navigate in a known indoor environment through the use of artificial vision. The general architecture of the robot is shown together with the data and control flow among the various subsystems. Also the inner structure of the latter complete with the functionalities are given in detail.

14245 (ESTSC–000428D078001) **POISSONSUPERFISH4.12: POISSON, SUPERFISH, Magnet and RF cavity design.** Holsinger, R.F. (Los Alamos National Lab., NM (United States)); Halbach, K. Los Alamos National Lab., NM (United States). 1 Jul 1993. Sponsored by USDOE, Washington, DC (United States). Source: ESTSC; Los Alamos National Laboratory.

Description: DEC VAX11/780; VMS; FORTRAN 77 (99%) C (1%); 1 Mag Tape. Source files end in .f. The PSFPLOT program generates POSTSCRIPT output, or can use GKS or subroutines INITT, CHRSIZ, TERM, NEWPAG, AOUTST, ANMODE, MOVABS, DRWABS and TINPUT from the proprietary Tektronix PLOT10. These routines are not included.

POISSON,SUPERFISH4.12 is a group of codes that solve Poisson's equation and are used to compute field quality for both magnets and fixed electric potentials and RF cavity codes that calculate resonant frequencies and field distributions of the fundamental and higher modes. The group includes: POISSON, PANDIRA, SUPERFISH, AUTOMESH, LATTICE, FORCE, MIRT, PAN-T, TEKPLOT, SF01, and SHY.

14246 (ESTSC–000587IBMPC01) **BARS/SSC/SPHINX4.0: BARS Bibliographic Data Retrieval System.** Herrmann, W. (Sandia National Labs., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States). 1 Jul 1993. Sponsored by USDOE, Washington, DC (United States). Source: ESTSC.

Description: IBM PC; DOS version 3.0 or higher.; askSam; 2 5.25 Diskettes. Data files must carry the extension .ASK. BARS requires the use of the askSam database program, of which a read-only runtime version is included under license from askSam Systems, SeaSide Software, Inc. PO Box 1428, Perry FL, 32347 USA. Distribution is via self-extracting files compressed using PKARC under license from PKWARE Inc, 7545 North Port Washington Rd., Glendale WI, 53217, USA. DOES NOT CONTAIN SOURCE CODE.

BARS is a program which allows retrieval of information from suitable bibliographic databases. Two databases are included, SSC and SPHINX, which together list bibliographic information for some 12,000 references related to the fields of shock compression of condensed media, high rate deformation of solids, and detonation.

14247 (ESTSC–000610D0VAX00) **PAT1.1: Pinellas Action Tracking System; Tracks Audit Findings and Corrective Actions.** Mellican, P.L. (Martin Marietta Speciality Components, Largo, FL (United States)). Martin Marietta Specialty Components, Inc., Largo, FL. 9 Apr 1993. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-92AL73000. Source: ESTSC.

Description: DEC VAX; VMS; SQL*FormS(75%), SQL*Plus(15%), PL/SQL(4%), SQL*Report(3%), SQL*ReportWriter(2%), DCL(1%); 1 Mag Tape. Oracle naming standards were used for naming conventions. File extensions of .SQL signify SQL*Plus reports, .RPT signifies SQL*ReportWriter reports, and .REP signifies SQL*Report reports. Package requires Oracle RDBMS which is not included.

PAT was derived from a system that began at the Rocky Flats Plant and was further enhanced at the Mound Plant. Pinellas Plant obtained this system in 1990 to track Tiger Team Findings; it has been expanded to include new modules which encompass a wide range of related functions. Functionality includes tracking of findings and associated corrective actions from various sources such as line operations, self-assessments, oversight assessments, and external organizations. Other functionality includes Management Walk-About tracking, NEPA prioritization, Occurence/incident Report corrective action tracking, and Management Action Item Tracking. The system utilizes state of the art relational database technology with pop-up windows for table lookups and entry of descriptive text. Standards such as assessment identification numbers, area designations, and finding category codes have been developed to provide enhanced query capabilities and the ability to group findings for trending purposes on a plant-wide basis.

14248 (INIS-mf–13780, pp. 46-47) **Quarks and heavy mesons at rho anti rho accelerators.** Gomshi Nobary, M.A. (Razi Univ., Kermanshah (Iran, Islamic Republic of) Faculty of Science). Iranian Physics Society, Teheran (Iran, Islamic Republic of). 1993. 112p. (In Persian). (CONF-9308219–: Iran's Physics Conference, Kermanshah (Iran, Islamic Republic of), 30 Aug - 2 sep 1993). In *Abstracts of articles from Iran's Physics conference, 1372.* Order Number DE94617985. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MESONS/computerized simulation; QUARKS/computerized simulation; ACCELERATORS; DIFFERENTIAL CROSS SECTIONS; LEPTONS; MESONS; PHASE SPACE; PROTON-ANTIPROTON INTERACTIONS; QUARKS; TOTAL CROSS SECTIONS

14249 (IS-T–1704) **Development of a low-latency scalar communication routine on message-passing architectures.** Pai, R. Ames Lab., IA (United States). 11 Jan 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE94007061. Source: OSTI; NTIS; GPO Dep.

One of the most significant advances in computer systems over the past decade is parallel processing. To be scalable to a large number of processing nodes and to be able to support multiple levels and forms of parallelism and its flexible use, new parallel machines have to be multicomputer architectures that have general

networking support and extremely low internode communication latencies. The performance of a program when ported to a parallel machine is limited mainly by the internode communication latencies of the machine. Therefore, the best parallel applications are those that seldom require communications which must be routed through the nodes. Thus the ratio of computation time to that of communication time is what determines, to a large extent, the performance metrics of an algorithm. The cost of synchronization and load imbalance appear secondary to that of the time required for internode communication and I/O, for communication intensive applications. This thesis is organized in chapters. The first chapter deals with the communication strategies in various message-passing computers. A taxonomy of inter-node communication strategies is presented in the second chapter and a comparison of the strategies in some existing machines is done. The implementation of communication in nCUBE Vertex O.S is explained in the third chapter. The fourth chapter deals with the communication routines in the Vertex O.S, and the last chapter explains the development and implementation of the scalar communication call. Finally some conclusions are presented.

14250 (IYaF–92-42) **Data acquisition system of the GDL facility.** Salikova, T.V. AN SSSR, Novosibirsk (Russian Federation). Inst. Yadernoj Fiziki. 1992. 32p. (In Russian). Order Number DE94616604. Source: OSTI; NTIS (US Sales Only); INIS.

Data acquisition system (DAS) operates in the RSX-IIM environment with the CAMAC system CAMAC driven and CAMAC control processor are used for the CAMAC system operation support. The exchange rate between a problem and the CAMAC module is equal to 100 K worf/c. 14 refs.

14251 (JAERI-M–93-177) **HERMES: a personal-computer program for calculation of the Fermi-Gas Model parameters of nuclear level density.** Mengoni, A. (ENEA, Bologna (Italy)); Nakajima, Yutaka. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 32p. Order Number DE94748556. Source: OSTI; NTIS; INIS.

A computer program, HERMES, that provides the quantities usually needed in nuclear level density calculations, has been developed. The applied model is the standard Fermi Gas Model (FGM) in which pairing correlations and shell effects are opportunely taken into account. The effects of additional nuclear structure properties together with their inclusion into the computer program are also considered. Using HERMES, a level density parameter systematics has been constructed for mass range $41 \leq A \leq 253$. (author).

14252 (JAERI-M–93-180) **A manual for RABTH, a code module to build effective cross section by solving one-dimensional ultra-fine energy group transport equation.** Naito, Yoshitaka (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Okuno, Hiroshi; Okuda, Yasuhisa. Japan Atomic Energy Research Inst., Tokyo (Japan). Sep 1993. 74p. (In Japanese). Order Number DE94748555. Source: OSTI; NTIS; INIS.

The procedure to calculate the effective cross section in the criticality safety evaluation code system JACS was to interpolate the Multigroup Cross Section Library MGCL with respect to the background cross section. For a reference calculation to the calculation following the Bondarenko method, a computational module RABTH has been developed to obtain the eigen ultra-fine (64,194 group) neutron flux with the collision probability method and the effective cross section by weighting with the flux. In the RABTH code module, the neutron source has an energy spectrum of fission neutrons from ^{235}U. The module utilizes the RABBLE code to solve the equations for one-dimensional cells in the fast energy groups, higher than about 1.9 eV, and the THERMOS code in the thermal energy groups, less than this energy. In this way the neutron flux distribution that covers the whole energy range is obtained. Both codes have been extended to treat not only slab and cylindrical cells but also a spherical cell in both complete reflective and vacuum boundary conditions, and the THERMOS code has been further revised for higher precision. This report includes practical information to treat RABTH module and basic equations for the extension and revision made to RABBLE and THERMOS codes. (author).

14253 (JINR-E–1-93-253) **New method for minimizing regular functions with constraints on parameter region.** Kurbatov, V.S.; Silin, I.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1993. 7p. Order Number DE94618340. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nucl. Instrum. Methods Phys. Res., Sect. A.

The new method of function minimization is developed. Its main features are considered. It is possible minimization of regular function with the arbitrary structure. For χ^2-like function the usage of simplified second derivatives is possible with the control of correctness. The constraints of arbitrary structure can be used. The means for fast movement along multidimensional valleys are used. The method is tested on real data of $K_{\pi 2}$ decay of the experiment on rare K^--decays. 6 refs.

14254 (JINR-R–6-92-427) **Determining of the optical parameters of the triplet systems in the SPIN-3 facility in YASNAPP-2.** Zafar, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1992. 11p. (In Russian). Order Number DE94616509. Source: OSTI; NTIS (US Sales Only); INIS.

A numerical method has been utilized to determine the stigmatic object image by the triplet system generally are calculated. 3 refs.; 2 figs.; 5 tabs.

14255 (JINR-R–9-93-240) **The mathematical simulation of physical processes in ECR multicharged ions sources.** Tokareva, N.A.; Shirkov, G.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). 1993. 10p. (In Russian). Order Number DE94618343. Source: OSTI; NTIS (US Sales Only); INIS.

The article presents a new model of the highly charged ion production in ECR sources which takes into account the violation of plasma charged neutrality condition. Mathematical methods have been analyzed to calculate the multicharged ion extraction in the RF pulse mode. The proposed calculation method has been chosen on the basis of the performed numerical experiments to solve the considered task. 10 refs.; 2 figs.

14256 (JINR-R–11-93-256) **Program package for magnetic system modelling.** Zhidkov, E.P.; Lima, S.; Polyakova, R.V.; Nodarse, F.F.; Yudin, I.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1993. 12p. (In Russian). Order Number DE94618342. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zh. Vychisl. Mat. Mat. Fiz.

RPMMS-1.0 program package is oriented to investigate the two-dimensional and some three-dimensional magnetic system based on POISSON, RELAX3D and GFUND3D code. Using this package some important and practical tasks related with the modernization of the EKSCHARM, HYPERON and CRION-C magnetic system facilities, have been solved. 12 refs.; 5 figs.; 1 tab.

14257 (LA-UR–93-2864) **Ethics and rationality in information-enriched decisions: A model for technical communication.** Dressel, S.B. (Los Alamos National Lab., NM (United States)); Carlson, P.; Killingsworth, M.J. Los Alamos National Lab., NM (United States). [1993]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940534–2: 41. annual conference of the Society for Technical Communication, Minneapolis, MN (United States), May 1994). Order Number DE93040251. Source: OSTI; NTIS; GPO Dep.

In a technological culture, information has a crucial impact upon decisions, but exactly how information plays into decisions is not always clear. Decisions that are effective, efficient, and ethical must be rational. That is, we must be able to determine and present good reasons for our actions. The topic in this paper is how information relates to good reasons and thereby affects the best decisions. A brief sketch of a model for decision-making, is presented which offers a synthesis of theoretical approaches to argument and to information analysis. Then the model is applied to a brief hypothetical case. The main purpose is to put the model before an interested audience in hopes of stimulating discussion and further research.

14258 (LA-UR–93-4438) **HIPPI, Fibre Channel, and ATM as gigabit/s LANs.** Tolmie, D. Los Alamos National Lab., NM (United States). [1993]. 7p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract W-7405-ENG-36. (CONF-940571–1: Networld + interop '94 engineer's conference, Las Vegas, NV (United States), 2-6 May 1994). Order Number DE94005089. Source: OSTI; NTIS; GPO Dep.

Computer networks that operate in the gigabit per second speed range are becoming very important for interconnecting supercomputers and other high end equipment. Some trends and applications are examined and criteria for selecting an interconnection technology are developed. HIPPI is the current interface of choice, while Fibre Channel and ATM are emerging standards. These systems are examined as to their backgrounds, advantages, and shortcomings.

14259 (LA-UR–94-604) **The Operator Shell: A means of privilege distribution under Unix.** Neuman, M.; Christoph, G. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404110–1: 3. FedUNIX annual conference on system administration, networking, and security, Washington, DC (United States), 4-9 Apr 1994). Order Number DE94007566. Source: OSTI; NTIS; GPO Dep.

The Operator Shell (Osh) is a setuid root, security enhanced, restricted shell for providing fine-grain distribution of system privileges for a wide range of usages and requirements. Osh offers a marked improvement over other Unix privilege distribution systems in its ability to specify access to both commands and files, auditing features, and familiar interface. This paper describes the design, features, security considerations, internals, and applications of the Operator Shell.

14260 (LA-UR–94-605) **Aspects of modeling uncertainty and prediction.** McKay, M.D. Los Alamos National Lab., NM (United States). [1993]. 14p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9310294–1: International workshop on model uncertainty: its characterization and quantification, Annapolis, MD (United States), 20-22 Oct 1993). Order Number DE94007565. Source: OSTI; NTIS; GPO Dep.

Probabilistic assessment of variability in model prediction considers input uncertainty and structural uncertainty. For input uncertainty, understanding of practical origins of probabilistic treatments as well as restrictions and limitations of methodology is much more developed than for structural uncertainty. There is a simple basis for structural uncertainty that parallels that for input uncertainty. Although methodologies for assessing structural uncertainty for models in general are very limited, more options are available for submodels.

14261 (LBL–31742) **The limits of intelligence in design.** Papamichael, K. (Lawrence Berkeley Lab., CA (United States)); Protzen, J.P. Lawrence Berkeley Lab., CA (United States). May 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9308203–1: 4. international symposium on system research, informatics and cybernetics, Baden-Baden (Germany), 3-4 Aug 1993). Order Number DE94004668. Source: OSTI; NTIS; GPO Dep.

A new, comprehensive design theory is presented, applicable to all design domains such as engineering and industrial design, architecture, city and regional planning, and, in general, any goal-oriented activity that involves decision making. The design process is analyzed into fundamental activities that are characterized with respect to the nature of knowledge requirements and the degree to which they can be specified and delegated to others, in general, and to computers in particular. The characterization of design problems as "wicked," or "ill-defined," design has been understood as a rational activity, that is "thinking before acting." The new theory presented in this paper suggests that design is "thinking and feeling while acting," supporting the position that design is only partially rational. Intelligence, "natural" or "artificial," is only one of two requirements for design, the other being emotions. Design decisions are only partially inferred, that is, they are not entirely the product of reasoning. Rather, design decisions are based on judgment that requires the notion of "good" and "bad," which is attributed to feelings, rather than thoughts. The presentation of the design theory extends to the implications associated with the limits of intelligence in design, which, in turn, become constraints on the potential role of computers in design. Many of the current development efforts in computer-aided design violate these constraints, especially in the implementation of expert systems and multi-criterion evaluation models. These violations are identified and discussed in detail. Finally, specific areas for further research and development in computer-aided design are presented and discussed.

14262 (NIIEFA-P-V–0869) **FIELD 3 - code complex for electrostatic field calculation in three-dimensional ranges as applied to ion and electron sources.** V'yuga, E.N.; Tikhomirov, A.S. Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (Russian Federation). 1991. 6p. (In Russian). Order Number DE94616605. Source: OSTI; NTIS (US Sales Only); INIS.

FIELD 3 - code complex for solving finite-difference analogue, Laplace equation in three-dimensional regions with arbitrary configuration of boundaries, using an atternate-tiangular method with minimal closures is developed. A differential diagram with $O(h^2)$ error is used. Results of test calculations are presented. The code complex is developed as applied to the ion and electron sources.

14263 (ORNL/TM–12506) **Analyzing PICL trace data with MEDEA.** Merlo, A.P. (Pavia Univ. (Italy). Dipt di Informatica e Sistemistica); Worley, P.H. Oak Ridge National Lab., TN (United States). Nov 1993. 32p. Sponsored by USDOE, Washington, DC (United States);Consiglio Nazionale delle Ricerche, Rome (Italy);Ministero dell'Universita' e della Ricerca Scientifica e Tecnologica (Italy). DOE Contract AC05-84OR21400. Grant 92-01571-PF69. Order Number DE94004788. Source: OSTI; NTIS; GPO Dep.

Execution traces and performance statistics can be collected for parallel applications on a variety of multiprocessor platforms by using the Portable Instrumented Communication Library (PICL). The static and dynamic performance characteristics of performance data can be analyzed easily and effectively with the facilities provided within the MEasurements Description Evaluation and Analysis tool (MEDEA). This report describes the integration of the PICL trace file format into MEDEA. A case study is then outlined that uses PICL and MEDEA to characterize the performance of a parallel benchmark code executed on different hardware platforms and using different parallel algorithms and communication protocols.

14264 (PNL-SA–21969) **The role of guideline-based design tools.** Fox, J.A. Pacific Northwest Lab., Richland, WA (United States). Oct 1993. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9310100–8: Human Factors and Ergonomics Society meeting, Seattle, WA (United States), 11-15 Oct 1993). Order Number DE94007482. Source: OSTI; NTIS; GPO Dep.

User System Interface (USI) design guidelines are one of the more popular tools that have been developed to aid designers in creating effective interfaces. When used properly, guidelines can provide the basis for a structured design methodology throughout the system life cycle. A survey published by Mosier and Smith (1986) provides an in-depth account of guideline usage. That 1986 survey showed that guidelines were used in varying degrees by virtually all types of people involved in the design and evaluation of USIs. Design guidelines are one of the older USI design tools, and the continued popularity of guidelines can be seen by the continued updating and expansion of guideline compendiums to keep up with new advances in the field.

14265 (SAND–92-1706) **Blind deconvolution of two-dimensional complex data.** Ghiglia, D.C.; Romero, L.A. Sandia National Labs., Albuquerque, NM (United States). Jan 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007254. Source: OSTI; NTIS; GPO Dep.

Inspired by the work of Lane and Bates on automatic multidimensional deconvolution, the authors have developed a systematic approach and an operational code for performing the deconvolution of multiply-convolved two-dimensional complex data sets in the absence of noise. They explain, in some detail, the major algorithmic steps, where noise or numerical errors can cause problems, their approach in dealing with numerical rounding errors, and where special noise-mitigating techniques can be used toward making

blind deconvolution practical. Several examples of deconvolved imagery are presented, and future research directions are noted.

14266 (SAND–93-2704C) **An Ω(√log log n) lower bound for routing in optical networks.** Goldberg, L.A. (Sandia National Labs., Albuquerque, NM (United States)); Jerrum, M.; MacKenzie, P.D. Sandia National Labs., Albuquerque, NM (United States). 6 Nov 1993. 23p. Sponsored by USDOE, Washington, DC (United States);Science and Engineering Research Council, Swindon (United Kingdom). DOE Contract AC04-94AL85000. Grant GR/F 90363; Grant 003658480. (CONF-940563–1: Symposium on theory of computing, Montreal (Canada), 23-25 May 1994). Order Number DE94003800. Source: OSTI; NTIS; GPO Dep.

Optical communication is likely to significantly speed up parallel computation because the vast bandwidth of the optical medium can be divided to produce communication networks of very high degree. However, the problem of contention in high-degree networks makes the routing problem in these networks theoretically (and practically) difficult. In this paper we examine Valiant's h-relation routing problem, which is a fundamental problem in the theory of parallel computing. The h-relation routing problem arises both in the direct implementation of specific parallel algorithms on distributed-memory machines and in the general simulation of shared memory models such as the PRAM on distributed-memory machines. In an h-relation routing problem each processor has up to h messages that it wishes to send to other processors and each processor is the destination of at most h messages. We present a lower bound for routing an h-relation (for any $h > 1$) on a complete optical network of size -n. Our lower bound applies to any randomized distributed algorithm for this task. Specifically, we show that the expected number of communication steps required to route an arbitrary h-relation is $\Omega(h + \sqrt{\log \log n})$. This is the first known lower bound for this problem which does not restrict the class of algorithms under consideration.

14267 (SAND–93-3979C) **Arithmetic averaging: A versatile technique for smoothing and trend removal.** Clark, E.L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940581–1: 40. international instrumentation symposium, Baltimore, MD (United States), 1-5 May 1994). Order Number DE94005274. Source: OSTI; NTIS; GPO Dep.

Arithmetic averaging is simple, stable, and can be very effective in attenuating the undesirable components in a complex signal, thereby providing smoothing or trend removal. An arithmetic average is easy to calculate. However, the resulting modifications to the data, in both the time and frequency domains, are not well understood by many experimentalists. This paper discusses the following aspects of averaging: (1) types of averages – simple, cumulative, and moving; and (2) time and frequency domain effects of the averaging process.

14268 (SAND–93-4088) **Varying execution discipline to increase performance.** Campbell, P.L.; Maccabe, A.B. Sandia National Labs., Albuquerque, NM (United States). 22 Dec 1993. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94007844. Source: OSTI; NTIS; GPO Dep.

This research investigates the relationship between execution discipline and performance. The hypothesis has two parts: 1. Different execution disciplines exhibit different performance for different computations, and 2. These differences can be effectively predicted by heuristics. A machine model is developed that can vary its execution discipline. That is, the model can execute a given program using either the control-driven, data-driven or demand-driven execution discipline. This model is referred to as a "variable-execution-discipline" machine. The instruction set for the model is the Program Dependence Web (PDW). The first part of the hypothesis will be tested by simulating the execution of the machine model on a suite of computations, based on the Livermore Fortran Kernel (LFK) Test (a.k.a. the Livermore Loops), using all three execution disciplines. Heuristics are developed to predict relative performance. These heuristics predict (a) the execution time under each discipline for one iteration of each loop and (b) the number of iterations taken by that loop; then the heuristics use those predictions to develop a prediction for the execution of the entire loop. Similar calculations are performed for branch statements. The second part of the hypothesis will be tested by comparing the results of the simulated execution with the predictions produced by the heuristics. If the hypothesis is supported, then the door is open for the development of machines that can vary execution discipline to increase performance.

14269 (SAND–93-4104C) **Note on the variance of autospectral density processed using Welch's method.** Smallwood, D.O. Sandia National Labs., Albuquerque, NM (United States). [1993]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940510–1: Annual technical meeting and exposition of the Institute of Environmental Sciences, Rosemont, IL (United States), 1-6 May 1994). Order Number DE94005352. Source: OSTI; NTIS; GPO Dep.

The variance of an estimate of an autospectral density (power spectral density) obtained using Welch's method is examined This error is examined in terms of a normalized error measure. Particular attention is given to the temporal windows and overlap processing.

14270 (SLAC–362) **JAZELLE users manual.** Johnson, A.S. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Apr 1990. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. Order Number DE94007668. Source: OSTI; NTIS; GPO Dep.

JAZELLE is a data management package, designed to provide facilities for data structure manipulation considerably more powerful than those provided by standard FORTRAN 77. Since JAZELLE is built on top of FORTRAN it cannot hope to provide the level of integration between program design and data structure typical of more modern languages, but by the use of data structure definitions (called TEMPLATES in JAZELLE jargon) and the power of MORTRAN macros, JAZELLE attempts to make the use and manipulation of data structures within programs as unobtrusive as possible.

14271 (UCRL-JC–114598) **Automatic contact in DYNA3D for vehicle crashworthiness.** Whirley, R.G.; Engelmann, B.E. Lawrence Livermore National Lab., CA (United States). 15 Jul 1993. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931121–38: Annual winter meeting of the American Society of Mechanical Engineers, New Orleans, LA (United States), 28 Nov - 3 dec 1993). Order Number DE94007143. Source: OSTI; NTIS; GPO Dep.

This paper presents a new formulation for the automatic definition and treatment of mechanical contact in explicit nonlinear finite element analysis. Automatic contact offers the benefits of significantly reduced model construction time and fewer opportunities for user error, but faces significant challenges in reliability and computational costs. This paper discusses in detail a new four-step automatic contact algorithm. Key aspects of the proposed method include automatic identification of adjacent and opposite surfaces in the global search phase, and the use of a smoothly varying surface normal which allows a consistent treatment of shell intersection and corner contact conditions without ad-hoc rules. The paper concludes with three examples which illustrate the performance of the newly proposed algorithm in the public DYNA3D code.

14272 (UCRL-JC–115840) **Preconditioned time-difference methods for advection-diffusion-reaction equations.** Aro, C. (California Univ., Davis, CA (United States). Dept. of Applied Science); Rodrigue, G.; Wolitzer, D. Lawrence Livermore National Lab., CA (United States). Jan 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404103–1: Colorado conference on iterative methods, Breckenridge, CO (United States), 4-10 Apr 1994). Order Number DE94006472. Source: OSTI; NTIS; GPO Dep.

Explicit time differencing methods for solving differential equations are advantageous in that they are easy to implement on a computer and are intrinsically very parallel. The disadvantage of explicit methods is the severe restrictions placed on stepsize due to stability. Stability bounds for explicit time differencing methods on advection-diffusion-reaction problems are generally quite severe and implicit methods are used instead. The linear systems arising from these implicit methods are large and sparse so that iterative

methods must be used to solve them. In this paper we develop a methodology for increasing the stability bounds of standard explicit finite differencing methods by combining explicit methods, implicit methods, and iterative methods in a novel way to generate new time-difference schemes, called preconditioned time-difference methods.

14273 (UCRL-MA–115837) **The FELICIA bulletin board system and the IRBIS anonymous FTP server: Computer security information sources for the DOE community: CIAC-2302.** Orvis, W.J. Lawrence Livermore National Lab., CA (United States). 3 Nov 1993. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE94008219. Source: OSTI; NTIS; GPO Dep.

The Computer Incident Advisory Capability (CIAC) operates two information servers for the DOE community, FELICIA (formerly FELIX) and IRBIS. FELICIA is a computer Bulletin Board System (BBS) that can be accessed by telephone with a modem. IRBIS is an anonymous ftp server that can be accessed on the Internet. Both of these servers contain all of the publicly available CIAC, CERT, NIST, and DDN bulletins, virus descriptions, the VIRUS-L moderated virus bulletin board, copies of public domain and shareware virus- detection/protection software, and copies of useful public domain and shareware utility programs. This guide describes how to connect these systems and obtain files from them.

14274 (WSRC-IM–92-109) **Savannah River Site application design architecture.** Westinghouse Savannah River Co., Aiken, SC (United States). 5 Jan 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007159. Source: OSTI; NTIS; GPO Dep.

SRS applications development organizations are under pressure to increase system quality and productivity, achievable in large part from taking advantage of emerging computing technologies. Client/server (C/S), information warehouse (IW), and object orientation (OO) are three of the emerging technologies that are beginning to influence the development and delivery of computing systems. To effectively manage the information resources in a rapidly changing environment, SRS must be able to rapidly build dynamic computing systems, to quickly access reliable data, and to present information on a variety of platforms. This is accomplished through four key concepts: (1) data will be managed from a site perspective; (2) the reporting of information is separate from processes that collect and store data; (3) self contained applications must be replaced by modularized software solutions; (4) application developers will develop solutions based on a common tool set consisting of standard components, products, and services. The ADA describes a comprehensive vision and defines the direction which SRS should follow in the delivery of computing systems. It defines the structure within which technology will be employed, it defines a common approach to applications delivery that ensures consistency, and it defines the functions necessary to the delivery of information. The ADA represents a new approach for application development. Significant benefits of implementing the architecture include: (1) improved ease of use, productivity, and quality for the end-user; (2) more efficient use of computer resources, resulting in the reduction of overall costs; (3) improved functionality: GUI, multimedia, data integration and easier access to shared data; (4) increased competitive advantage from leveraging technology.

14275 (WSRC-MS–93-576) **A review of sensitivity analysis techniques.** Hamby, D.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1993]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE94007192. Source: OSTI; NTIS; GPO Dep.

Mathematical models are utilized to approximate various highly complex engineering, physical, environmental, social, and economic phenomena. Model parameters exerting the most influence on model results are identified through a "sensitivity analysis." A comprehensive review is presented of more than a dozen sensitivity analysis methods. The most fundamental of sensitivity techniques utilizes partial differentiation whereas the simplest approach requires varying parameter values one-at-a-time. Correlation analysis is used to determine relationships between independent and dependent variables. Regression analysis provides the most comprehensive sensitivity measure and is commonly utilized to build response surfaces that approximate complex models.

9903 Information Handling

Refer also to citation(s) 11604, 11705, 11719, 12175, 12244, 12272, 12327, 12430, 12749, 13030, 13193, 13610, 13814, 14246, 14263, 14273, 14274

14276 (ANL/CMT-ACL/PP–72621) **Utility programs used for EPA Contract Laboratory Program computations.** Hwang, E.Y.; Wingender, R.J. Argonne National Lab., IL (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94008482. Source: OSTI; NTIS; GPO Dep.

Four computer programs were developed to manipulate GC/MS data and expedite both sample turnaround time and data package preparation for presentation of data following the EPA Contract Laboratory Program requirements. One program rapidly determines if the GC/MS daily standard has met QC criteria and therefore allows more samples to be analyzed within the 12-hour time limit. Another extracts total ion current for quantitation of tentatively identified compounds. The limit of detection is obtained on an as needed basis by the third, and the fourth provides a list of the names of target compounds, internal standards, and surrogate standards from the daily standard with their retention times in increasing order of elution. This paper describes the format, data entry approach, and procedures to set up and run these programs.

14277 (DOE/RL–93-69) **Tri-Party Agreement databases, access mechanism and procedures.** Brulotte, P.J.; Christensen, K.C. USDOE Richland Operations Office, WA (United States). Oct 1993. 35p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94004893. Source: OSTI; NTIS; GPO Dep.

This document contains the information required for the Washington State Department of Ecology (Ecology) and the US Environmental Protection Agency (EPA) to access databases related to the Hanford Federal Facility Agreement and Consent Order [also known as the Tri-Party Agreement (TPA)] (Ecology et al. 1992). It identifies the procedure required to obtain access to the Hanford computer networks and the TPA related databases. It addresses security requirements, access methods, database availability dates, database access procedures, and the minimum computer hardware and software configurations required to operate within the Hanford networks.

14278 (NUKEM-FuE–91015) **Corrosion data base for the fuel cycle (phase 2): Final report.** Nuklear-Chemie und - Metallurgie GmbH (NUKEM), Hanau (Germany). Dec 1991. 30p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT KWA1612A. Order Number DE94752436. Source: OSTI; NTIS (US Sales Only); INIS.

The objetive of the present project consisted in preparing, summarizing and storing in a data base designed as an information system, corrosion data, in particular those related to the fast breeder fuel cycle, but also those obtained from other appropriate sources. The said information system had to be set up as a modern user-friendly data processing program for use in commercial personal computers. Based on studies of nitric acid corrosion of austenitic steels (typical material/corrosive combination of the area of spent fuel reprocessing from nuclear power plants), parameters considered important were determined in coordination with materials experts, and structured in the form of a catalogue. That catalogue was organized by means of a relational data base management system as a fact data base into which suitable information from original literature was included. (orig.)

14279 (ORNL/TM–12651) **Using the National Information Infrastructure for social science, education, and informed decision making.** Tonn, B.E. Oak Ridge National Lab., TN (United States). 7 Jan 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94005442. Source: OSTI; NTIS; GPO Dep.

The United States has aggressively embarked on the challenging task of building a National Information Infrastructure (NII). This infrastructure will have many levels, extending from the building block capital stock that composes the telecommunications system to the multitude of higher tier applications hardware and software tied to this system. This "White Paper" presents a vision for a second and third tier national information infrastructure that focuses exclusively on the needs of social science, education, and decision making (NII-SSEDM). NII-SSEDM will provide the necessary data, information, and automated decision support and educational tools needed to help this nation solve its most pressing social problems. The proposed system has five components: 'data collection systems; databases; statistical analysis and modeling tools; policy analysis and decision support tools; and materials and software specially designed for education. This paper contains: a vision statement for each component; comments on progress made on each component as of the early 1990s; and specific recommendations on how to achieve the goals described in the vision statements. The white paper also discusses how the NII-SSEDM could be used to address four major social concerns: ensuring economic prosperity; health care; reducing crime and violence; and K-12 education. Examples of near-term and mid-term goals (e.g., pre-and post Year 2000) are presented for consideration. Although the development of NII-SSEDM will require a concerted effort by government, the private sector, schools, and numerous other organizations, the success of NH-SSEDM is predicated upon the identification of an institutional "champion" to acquire and husband key resources and provide strong leadership and guidance.

14280 (WSRC-MS–94-029) **Managing performance of DB2 Ad Hoc Reports.** Chow, A. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-940595–1: 4. annual conference of the international DB2 users group, San Diego, CA (United States), 8-12 May 1994). Order Number DE94006669. Source: OSTI; NTIS; GPO Dep.

The DB2 financial reporting systems at Westinghouse Savannah River Company consists of 212 standardized reports that over 1034 users have accessed in 1993 to generate their reports. Each report has a range of selection criteria that the users can specify. Depending on the selection criteria, a report can access from a few rows to millions of rows of data. When this new DB2 system went into production in 1992, the CPU was at 100% utilization. From the beginning, ad hoc reports had a backlog of 4–5 days. Since DB2 was a new DBMS, most people blamed the poor report turn around times on DB2 as an inefficient DBMS and on a shortage of CPU cycles. Since we are unable to purchase a more powerful CPU, the only option left to us was to improve report turn around was system and application performance tuning. This document presents our efforts in these areas. Education of users in report submission was a starting point. And as to index tuning techniques that were applied, we created more friendly indexes, used clustering indexes, and used a reorganizing mechanism. A more efficient SQL was written which saved a lot of money.

9904 Law

Refer also to citation(s) 11719, 12114, 12157

14281 (IAEA-SM–332, pp. 40-41) **International cooperation: A condition for further development of nuclear power.** D'Onghia, B. (International Union of Producers and Distributors of Electrical Energy (UNIPEDE)); Burtheret, J. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Administrative, economical, political, environmental and technical issues of international cooperation aimed at further development of nuclear power are discussed.

14282 (IAEA-SM–332, pp. 42-43) **Korean views on needs for international cooperation in development and development of advanced nuclear power systems.** Yoon, Young Ku; Lee, Byong Whi; Shim, Chang Saeng. International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

Korea methodology and experience in international cooperation in the field of construction and operation of nuclear power plants as well as Korean views on development and deployment of advanced nuclear power systems are presented.

14283 (IAEA-SM–332, pp. 46-47) **Progress towards a nuclear safety convention.** Rosen, M. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety). International Atomic Energy Agency, Vienna (Austria); Korea Electric Power Corp. (KEPCO), Seoul (Korea, Republic of); European Nuclear Society (ENS), Bern (Switzerland); Commission of the European Communities, Brussels (Belgium); Korea Atomic Industrial Forum (KAIF), Inc., Seoul (Korea, Republic of); Korean Nuclear Society (KNS), Seoul (Korea, Republic of); Nuclear Energy Agency, 75 - Paris (France); World Energy Council, London (UK). 1993. 47p. (CONF-931028–: International symposium on the advanced nuclear power systems: design, technology and strategies for their development, Seoul (Korea, Republic of), 18-22 Oct 1993). In *Book of extended synopses. International symposium on advanced nuclear power systems. Design, technology, safety and strategies for their deployment.* Order Number DE94621250. Source: OSTI; NTIS (US Sales Only); INIS.

A progress towards in developing Nuclear safety convention is reported in this paper.

14284 (INIS-XN–479) **Cooperation Agreement between the Government of Australia and the European Organization for Nuclear Research (CERN) concerning the further development of scientific and technical co-operation in the research projects of CERN.** Australia. 1991. 7p. Order Number DE94618327. Source: OSTI; NTIS (US Sales Only); INIS.

This agreement was concluded on 1 November 1991 for five years and is renewable. Australia will participate in the CERN research projects in the field of experimental and technical physics, accelerator and detector engineering. (NEA).

14285 (NEI-SE–145) **Alterations in the atomic energy laws.** Sweden. Mar 1993. 10p. (In Swedish). Order Number DE94616595. Source: OSTI; NTIS; INIS.

Recent alterations in the Swedish atomic energy laws are presented.

Corporate Author Index

This index lists the corporate authors responsible for issuing the documents in this publication which are identified primarily by report number. The corporate names are entered in standardized forms as defined in ETDE/PUB–3 (Rev.1), *International Energy: Research Organizations 1988–1992*. Each entry under a corporate name includes the document title and citation number. Three items of information may appear in parentheses: (1) an abbreviation to identify the document type, such as a report; (2) the country of publication, indicated by International Organization for Standardization (ISO) country code; and (3) the language of the document if non-English (R;CA;In French). Author affiliations are not listed in this index.

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Argonne National Lab., Washington, DC (United States)
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Arizona State Univ., Tempe, AZ (United States). Dept. of Chemistry and Biochemistry
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Arizona Univ., Tucson, AZ (United States). Dept. of Soil and Water Science
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Arkansas Univ., Fayetteville, AR (United States)
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Arkansas Univ., Little Rock, AR (United States)
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Asociacion Nuclear Asco, Barcelona (Spain)
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Associacao Brasileira de Polimeros, Sao Paulo, SP (Brazil)
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Association Euratom-Kernforschungsanlage Juelich GmbH (Germany)
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Atomic Energy Control Board, Ottawa, ON (Canada)
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Atomic Energy Control Board, Ottawa, ON (Canada). Advisory Committee on Radiological Protection
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Atomic Energy of Canada Ltd., Chalk River, ON (Canada). Chalk River Nuclear Labs.
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Atomic Energy Organization of Iran, Teheran (Iran, Islamic Republic of). Laser Research Center
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CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Physique Nucleaire
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CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Direction des Sciences de la Matiere
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CEA-Ecole Polytechnique, 91 - Palaiseau (France). Lab. d'Etudes des Solides Irradies
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Cedar Design Systems Ltd., London (United Kingdom)
Software quality assurance and information management, October 1986 to October 1992: Final report, 19:11679 (R;GB)

Central Research Inst. of Electric Power Industry, Komae, Tokyo (Japan). Komae Research Lab.
Creep-fatigue criteria and inelastic behavior of modified 9Cr-1Mo steel at elevated temperatures: Final report, 19:12533 (R;US)

Centro Tecnico Aeroespacial, Sao Jose dos Campos, SP (Brazil). Inst. Tecnologico de Aeronautica
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CER Corp., Las Vegas, NV (United States)
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CH2M Hill Southeast, Inc., Oak Ridge, TN (United States)
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Chalmers Univ. of Technology, Goeteborg (Sweden). Inst. for Electromagnetic Field Theory and Plasma Physics
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Chem Waste Management (CWM) Federal Environmental Services, Inc. (United States)
Uranium Mill Tailings Remedial Action Project Annual Environmental Monitoring Report calendar year 1992: Volume 1, 19:11693 (R;US)
Uranium Mill Tailings Remedial Action Project Annual Environmental Monitoring Report calendar year 1992: Volume 2, 19:11694 (R;US)

ChemRisk, Alameda, CA (United States)
Oak Ridge Health Studies Phase 1 report, Volume 2: Part A, Dose Reconstruction Feasibility Study: Tasks 1 and 2, A summary of historical activities on the Oak Ridge Reservation with emphasis on information concerning off-site emissions of hazardous materials, 19:11801 (R;US)
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Oak Ridge Health Studies Phase 1 report, Volume 2: Part C, Dose Reconstruction Feasibility Study: Tasks 5: A summary of information concerning historical locations and activities of populations potentially affected by releases from the Oak Ridge Reservation, 19:11838 (R;US)
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Chicago Univ., IL (United States). Dept. of Astronomy and Astrophysics
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Children's Hospital of Philadelphia, PA (United States)
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Cincinnati Univ., OH (United States)
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Cincinnati Univ., OH (United States). Coll. of Engineering
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Clark Univ., Worcester, MA (United States)
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Clarkson Univ., Potsdam, NY (United States). Dept. of Mechanical and Aeronautical Engineering
A computational model for coal transport and combustion: Quarterly technical progress report, September 1, 1993–November 30, 1993, 19:11514 (R;US)

Clermont-Ferrand-2 Univ., 63 - Aubiere (France). Lab. de Physique Corpusculaire
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CNG Research Co., Pittsburgh, PA (United States)
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Coal Technology Corp., Bristol, VA (United States)
Development of an advanced, continuous mild gasification process for the production of co-products: Quarterly report, July–September 1993, 19:11424 (R;US)
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Cohen (S.) and Associates, Inc., McLean, VA (United States)
Characterization of Class A low-level radioactive waste 1986–1990: Volume 1: Executive summary, 19:11724 (R;US)
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Colorado State Univ., Fort Collins, CO (United States)
Role of polycrystallinity in CdTe and $CuInSe_2$ photovoltaic cells: Annual subcontract report, 1 April 1992–31 March 1993, 19:11951 (R;US)

Colorado Univ., Boulder, CO (United States). Dept. of Astrophysical, Planetary, and Atmospheric Sciences
Collisional and chaotic transport of energetic particles in toroidal plasma: [Annual] progress report, 19:14132 (R;US)

Colorado Univ., Boulder, CO (United States). Dept. of Chemical Engineering
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Columbia Univ., New York, NY (United States)
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Surfactant loss control in chemical flooding: Spectroscopic and calorimetric study of adsorption and precipitation on reservoir minerals: Quarterly technical progress report, July 1, 1993–September 30, 1993, 19:11546 (R;US)

Columbia Univ., New York, NY (United States). Dept. of Chemistry
Theoretical studies of electron transfer and optical spectroscopy: Progress report, September 25, 1990–January 31, 1994, 19:13911 (R;US)

Combustion Engineering, Inc., Windsor, CT (United States)
CE IGCC Repowering plant sulfuric acid plant: Topical report, June 1993, 19:11427 (R;US)
CE IGCC repowering project preliminary hazard analysis: Topical report, November 1, 1990–May 31, 1993, 19:11425 (R;US)
CE IGCC repowering project: Bins and lockhoppers: Topical report, 1 January, 1992–28 February, 1993, 19:11513 (R;US)
CE IGCC repowering project: Clean Coal II Project: Annual report, 1 January, 1992–31 December, 1992, 19:11983 (R;US)
CE IGCC repowering project: Controls & instrumentation: Topical report, June 1993, 19:11984 (R;US)
CE IGCC repowering project: Materials for coal gasification environment: Topical report, June 1993, 19:11982 (R;US)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 4, July–September 1993, 19:11520 (R;US)

Commission of the European Communities, Abingdon (UK). JET Joint Undertaking
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Commission of the European Communities, Brussels (Belgium)
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Commission of the European Communities, Luxembourg (Luxembourg)
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Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States)
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Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States). Dept. of Natural Resources
Umatilla River Basin Trap and Haul Program annual report 1993, 19:11939 (R;US)

Confederated Tribes of the Warm Springs Reservation of Oregon, OR (United States)
Oregon Trust Agreement Planning Project: Potential mitigations to the impacts on Oregon wildlife resources associated with relevant mainstem Columbia River and Willamette River hydroelectric projects, 19:11938 (R;US)

CONSOL, Inc., Library, PA (United States)
Coal liquefaction process streams characterization and evaluation: Quarterly technical progress report, January 1–March 31, 1993, 19:11444 (R;US)

Consortium for Coal-Water Slurry Fuel Technology, University Park, PA (United States)
The development of coal-based technologies for Department of Defense Facilities: Semiannual technical progress report, March 28, 1993–September 27, 1993, 19:11521 (R;US)

Continental Shelf Associates, Inc., Jupiter, FL (United States)
Environmental and economic assessment of discharges from Gulf of Mexico Region oil and gas operations: Quarterly technical progress report, 23 June 1992–30 September 1992, 19:11576 (R;US)

Cornell Univ., Ithaca, NY (United States)
Mechanisms and genetic control of interspecific crossing barriers in lycopersicon: Progress report, First year, August 1, 1992, 19:13195 (R;US)

Corps of Engineers, Portland, OR (United States). North Pacific Div.
Daily/hourly hydrosystem operation: How the Columbia River system responds to short-term needs, 19:11921 (R;US)

Cummins Engine Co., Inc., Columbus, IN (United States)
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D'Anna B'Nana, Pahoa, HI (United States)
Community Geothermal Technology Program: Media steam pasteurization using geothermal fluid at NELHA, Noi'i O Puna laboratory: Final report, 19:11968 (R;US)

Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution
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Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Stuttgart (Germany). Inst. fuer Bauweisen- und Konstruktionsforschung
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Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)
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Deutsches Elektronen-Synchrotron (DESY), Zeuthen (Germany). Inst. fuer Hochenergiephysik
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Douglas United Nuclear, Inc., Richland, WA (United States)
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Dravo Lime Co., Pittsburgh, PA (United States)
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Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant
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Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept.
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Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept.
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Duke Univ., Durham, NC (United States). Dept. of Mathematics
High-resolution numerical methods for compressible multi-phase flow in hierarchical porous media: Progress report, September 1993–September 1994, 19:12778 (R;US)

E

Eastern Research Group, Inc., Lexington, MA (United States)
Characterization of Class A low-level radioactive waste 1986–1990: Volume 1: Executive summary, 19:11724 (R;US)
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Eastern Washington Univ., Chaney, WA (United States). Upper Columbia United Tribes Fisheries Research Center
Measurement of thyroxine concentration as an indicator of the critical period for imprinting in kokanee salmon (Oncorhynchus nerka): Implications for operating Lake Roosevelt kokanee hatcheries: Supplement: Lake Roosevelt Monitoring Program – 1991 annual report, 19:13133 (R;US)

Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP)
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Edelstahlwerk Witten AG (Germany)
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EG and G Energy Measurements, Inc., Las Vegas, NV (United States)
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EG and G Energy Measurements, Inc., Los Alamos, NM (United States). Los Alamos Operations
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EG and G Idaho, Inc., Idaho Falls, ID (United States)
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Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Neutronenstreuung
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Electric Power Research Inst., Palo Alto, CA (United States)
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Electronic Power Conditioning, Inc., Corvallis, OR (United States)
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ENEA, Frascati (Italy). Centro Ricerche Energia - Area Energia e Innovazione
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Energia-Ekono, Espoo (Finland)
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Energy and Environmental Research Corp., Irvine, CA (United States)
Clean Coal Technology: Reduction of NO_x and SO_2 using gas reburning, sorbent injection, and integrated technologies: Topical report No. 3, Revision 1, 19:12052 (R;US)

Energy International Corp., Pittsburgh, PA (United States)
Technology development for cobalt F-T catalysts: Quarterly technical progress report No. 3, April 1, 1993–June 30, 1993, 19:12677 (R;US)
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Envair, Kennewick, WA (United States)
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Environmental Evaluation Group, Albuquerque, NM (United States)
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European Fast Reactor (EFR), Karlsruhe (Germany)
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Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)
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Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project
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Finnish Pulp and Paper Research Inst., Espoo (Finland)
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Fish and Wildlife Service, Portland, OR (United States)
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Florida Univ., Gainesville, FL (United States)
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Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik
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Forschungszentrum Rossendorf e.V. (FZR) (Germany). Inst. fuer Sicherheitsforschung
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Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany)
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Fraunhofer-Institut fuer Systemtechnik und Innovationsforschung (ISI), Karlsruhe (Germany)
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Fuel Cell Engineering Corp., Danbury, CT (United States)
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Gemeinschaftskernkraftwerk Grohnde GmbH, Emmerthal (Germany)
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General Atomics, San Diego, CA (United States)
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Geo-Microbial Technologies, Inc., Ochelata, OK (United States)
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Geological Survey, Denver, CO (United States)
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Geological Survey, Denver, CO (United States). Petroleum Geology Branch
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Geoscience Electronics Corp., Westlake Village, CA (United States)
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Gesellschaft fuer Reaktorsicherheit mbH (GRS), Koeln (Germany)
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Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)
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Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires
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GSF - Forschungszentrum fuer Umwelt und Gesundheit GmbH, Neuherberg (Germany)
Ecological and chemical investigations of the environmental quality in the five new Laender. Pt. 5: Polychlorinated biphenyls, 19:13081 (R;DE;In German)
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H and R Technical Associates, Inc., Oak Ridge, TN (United States)
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Hahn-Meitner-Institut Berlin GmbH (Germany). Bereich Schwerionenphysik
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Hanford Engineer Works, Richland, WA (United States)
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Hawaii Univ., Honolulu, HI (United States)
Community Geothermal Technology Program: Hawaii glass project: Final report, 19:11960 (R;US)
Community Geothermal Technology Program: Cloth dyeing by geothermal steam: An experiment in technology transfer from Japan to Hawaii, Final report, 19:11965 (R;US)
Community Geothermal Technology Program: Silica bronze project: Final report, 19:11961 (R;US)

Community Geothermal Technology Program: Experimental lumber drying kiln: Final report, 19:11966 (R;US)

Health and Safety Executive, London (United Kingdom)
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Health and Safety Executive, London (United Kingdom). Nuclear Installations Inspectorate
Statement of nuclear incidents at nuclear installations, 19:12145 (I;GB)

Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Energy Engineering
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Helsinki Univ. of Technology, Otaniemi (Finland). Lab. of Metallurgy
Better utilization of Cr-containing materials: Final report, 19:12436 (R;FI;In Finnish)
New iron- and steelmaking technologies: Final report, 19:12435 (R;FI;In Finnish)

Horizon Data Corp., Reston, VA (United States). Power Information Center
Interagency Advanced Power Group, Joint Electrical and Nuclear Working Group, meeting minutes, November 16–17, 1993, 19:12996 (R;US)
Interagency Advanced Power Group – Steering group meeting minutes, 19:14211 (R;US)
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Houston Univ., TX (United States). Dept. of Chemistry
Chemical vapor deposition of metal nitrides, phosphides and arsenides: Final report, 19:12582 (R;US)

Howard Univ., Washington, DC (United States)
Progress report for subcontract 9-X33-LO152-1, 19:12681 (R;US)

HSW Environmental Consultants, Inc., Oak Ridge, TN (United States)
Groundwater quality assessment for the Upper East Fork Poplar Creek Hydrogeologic Regime at the Y-12 Plant: 1991 groundwater quality data and calculated rate of contaminant migration, 19:11793 (R;US)

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ICI Tracerco, Billingham (United Kingdom)
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Idaho Dept. of Fish and Game, Boise, ID (United States). Fisheries Research Section
Idaho habitat and natural production monitoring: Part 1: Annual report 1992, 19:11934 (R;US)
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IIT Research Inst., Chicago, IL (United States)
Demonstration testing and evaluation of in situ soil heating: Management Plan, 19:13074 (R;US)

Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States)
An attrition-resistant zinc titanate sorbent for sulfur: Final technical report, September 1, 1992–August 31, 1993, 19:11498 (R;US)
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Behavior of sulfur and chlorine in coal during combustion and boiler corrosion: Final technical report, 1 September, 1992–31 August, 1993, 19:11522 (R;US)
Biodesulfurization of mild gasification liquid products: Final technical report, 1 September, 1992–31 August, 1993, 19:11458 (R;US)
Carbonation as a binding mechanism for coal/calcium hydroxide pellets: Final technical report, 1 September, 1992–31 August, 1993, 19:11416 (R;US)
Characterization of available coals from Illinois mines: Final technical report, September 1, 1992–August 31, 1993, 19:11483 (R;US)
Clean, premium-quality chars: Demineralized and carbon enriched: Final technical report, 1 September, 1992–31 August, 1993, 19:11452 (R;US)
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Combustion and emissions characterization of pelletized coal fuels: Final technical report, September 1, 1992–August 31, 1993, 19:11524 (R;US)
Combustion properties of coal-char blends: NO_x emission characteristics: Interim final technical report, September 1, 1992–August 31, 1993, 19:11525 (R;US)
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Integrated methods for production of clean char and its combustion properties: Interim final technical report, September 1, 1992–August 31, 1993, 19:11523 (R;US)
Integrated production/use of ultra low-ash coal, premium liquids and clean char: Interim final technical report, 1 September, 1992–31 August, 1993, 19:11469 (R;US)
Investigation of a sulfur reduction technique for mild gasification char: Final technical report, September 1, 1992–August 31, 1993, 19:11470 (R;US)
Mass spectral study of organic sulfur in the polymeric matrix of coal: Final technical report, September 1, 1992–August 31, 1993, 19:11485 (R;US)
Microbial stabilization of sulfur-laden sorbents: Final technical report, September 1, 1992–August 31, 1993, 19:11496 (R;US)
Microbial strain improvement for organosulfur removal from coal: Final technical report, 1 September, 1992–31 August, 1993, 19:11454 (R;US)
Mild temperature gasification: Partitioning sulfur to gas as H_2S: Interim final technical report, 1 September, 1992–31 August, 1993, 19:11455 (R;US)
Molecular biological enhancement of coal biodesulfurization: Quarterly technical report, September 1, 1993–November 30, 1993, 19:11461 (R;US)
Na/Ca catalyzation of Illinois coals for gasification: Final technical report, September 1, 1992–August 31, 1993, 19:11449 (R;US)
Physical cleaning of waste coal by dissolved-CO_2 flotation: Final technical report, September 1, 1992–August 31, 1993, 19:11457 (R;US)
Plasma-assisted cleanup of flue gas: Final technical report, 1 September, 1992–31 August, 1993, 19:11497 (R;US)
Production of carbon molecular sieves from Illinois coal: Final technical report, 1 September, 1992–31 August 1993, 19:11468 (R;US)
Protocols for the selective cleavage of carbon-sulfur bonds in coal: Interim final technical report, September 1, 1992–August 31, 1993, 19:11451 (R;US)
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Recovery and utilization of gypsum and limestone from scrubber sludge: Final technical report, September 1, 1992–August 31, 1993, 19:11495 (R;US)
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Sulfur removal from high-sulfur Illinois coal by low-temperature perchloroethylene (PCE) extraction: Final technical report, 1 September, 1992–31 August, 1993, 19:11453 (R;US)
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Utilization of Illinois coal gasification slags for production of ultra-lightweight aggregates: Final technical report, September 1, 1992–August 31, 1993, 19:11467 (R;US)
VHF EPR analysis of organic sulfur in coal: Final technical report, September 1, 1992–August 31, 1993, 19:11484 (R;US)

Imagination Resources, Inc., Dublin, OH (United States)
Measurement of viscosity, density, and gas solubility of refrigerant blends in selected synthetic lubricants: Quarterly report, October 1–December 30, 1993, 19:12598 (R;US)

Indian Society for Radiation Physics, Kalpakkam (India). Kalpakkam Chapter
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Insinoeeritoimisto Prosessikemia Ky, Turku (Finland)
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Institut National Polytechnique, 38 - Grenoble (France)
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Instituto de Pesquisas Espaciais (INPE), Sao Jose dos Campos, SP (Brazil)
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Instituto Tecnologico, Toluca (Mexico)
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International Atomic Energy Agency, Vienna (Austria)
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Iranian Physics Society, Teheran (Iran, Islamic Republic of)
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Martin Marietta Specialty Components, Inc., Largo, FL
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Maryland Univ., College Park, MD (United States). Dept. of Physics
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Massachusetts Inst. of Tech., Cambridge, MA (United States)
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Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center
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Max-Planck-Institut fuer Eisenforschung GmbH, Duesseldorf (Germany)
Effects of phosphorus and other impurities in materials from steam turbines on the mechanical and corrosion properties. Pt. 1 and 2: COST 505 - final report, 19:12500 (R;DE)

Max-Planck-Institut fuer Metallforschung, Stuttgart (Germany). Inst. fuer Werkstoffwissenschaften
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Media and Process Technology, Inc., Pittsburgh, PA (United States)
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Medical Univ. of South Carolina, Charleston, SC (United States)
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Meditsinska Akademiya, Sofia (Bulgaria)
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Memorial Sloan-Kettering Cancer Center, New York, NY (United States)
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Michigan Biotechnology Inst., Lansing, MI (United States)
Bioconversion of coal derived synthesis gas to liquid fuels: Final quarterly technical progress report, July 1, 1993–September 30, 1993, 19:11919 (R;US)

Michigan State Univ., East Lansing, MI (United States). Carcinogenesis Lab.
Malignant transformation of human fibroblasts by neutrons and by gamma radiation: Relationship to mutations induced: Progress report, [January 1, 1993–December 31, 1993], 19:13230 (R;US)

Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering
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Michigan Univ., Ann Arbor, MI (United States)
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Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering
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Ministry of Trade and Industry, Helsinki (Finland). Energy Dept.
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Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering
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Mission Research Corp., San Diego, CA (United States)
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MK-Ferguson Co., Albuquerque, NM (United States)
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Morgan State Univ., Baltimore, MD (United States)
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MOS, Inc., Melville, NY (United States)
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MSE, Inc., Butte, MT (United States)
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Netherlands Energy Research Foundation (ECN), Petten (Netherlands)
Recycling long-lived waste components in high-flux thermal systems, 19:11698 (R;NL)

Nevada Univ., Las Vegas, NV (United States)
Heat transfer studies of waste repository design: Progress report, [October 1, 1993–December 31, 1993], 19:11685 (R;US)

Nevada Univ., Las Vegas, NV (United States). Dept. of Civil and Environmental Engineering
DOE Waste Package Project: Quarterly progress report, October 1, 1993–December 31, 1993, 19:11683 (R;US)

Nevada Univ., Las Vegas, NV (United States). Harry Reid Center for Environmental Studies
Analytical laboratory and mobile sampling platform: Progress report, October 1, 1993–December 31, 1993, 19:13072 (R;US)
Fingerprinting of groundwater by ICP-MS: Progress report, October 1, 1992–December 31, 1992, 19:13073 (R;US)
Identification and characterization of conservative organic tracers for use as hydrologic tracers for the Yucca Mountain site characterization project: Quality Assurance Project Plan, Revision 1: Quarterly progress report, October 1, 1993–December 31, 1993, 19:11684 (R;US)

Nevada Univ., Reno, NV (United States). Desert Research Inst.
Archaeological investigations at a toolstone source area and temporary camp: Sample Unit 19-25, Nevada Test Site, Nye County, Nevada: Technical report No. 77, 19:11800 (R;US)
Remote sensing for the geobotanical and biogeochemical assessment of environmental contamination, 19:13037 (R;US)

Nevada Univ., Reno, NV (United States). Water Resources Center
Hydrologic database user's manual, 19:13071 (R;US)
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New Mexico State Univ., Las Cruces, NM (United States)
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New Mexico State Univ., Las Cruces, NM (United States). Dept. of Mechanical Engineering
INTRAVAL Phase 2: Modeling testing at the Las Cruces Trench Site, 19:11721 (R;US)

New Mexico Univ., Albuquerque, NM (United States)
Advanced NMR-based techniques for pore structure analysis of coal: Quarterly report No. 9, October 1, 1993–December 30, 1993, 19:11480 (R;US)

New Mexico Univ., Albuquerque, NM (United States). Dept. of Electrical and Computer Engineering
Research on foil transport of intense electron beams: Final report, 19:13386 (R;US)

New Mexico Univ., Albuquerque, NM (United States). Dept. of Mechanical Engineering
THERM3D – A boundary element computer program for transient heat conduction problems, 19:12774 (R;US)

New Orleans Univ., LA (United States)
Electronic and nuclear factors in intramolecular charge and excitation transfer processes: [Annual report], October 1992–September 1993, 19:13837 (R;US)

No corporate text available
8 GHz experiment on FTU, 19:14158 (R;IT)
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Waste processing plant eco-auditing system for minimization of environmental risk: European Communities regulatory proposal, 19:11914 (R;IT;In Italian)

Nordisk Kernesikkerhedsforskning, Roskilde (Denmark)
Conservation and retrieval of information: Elements of a strategy to inform future societies about nuclear waste repositories, 19:11719 (R;DK)
The Nordic programme for nuclear safety 1990 - 1993: Status report for the first half-year 1993, 19:14223 (R;DK;In English, Swedish, Norwegian)

North Carolina State Univ., Raleigh, NC (United States). Dept. of Chemistry
Microreflectance infrared study of electron-molecular vibrational coupling and lattice softness in BEDT-TTF salts, 19:12593 (R;US)

North Carolina State Univ., Raleigh, NC (United States). Dept. of Physics
The zinc electrode: Reactions and mechanisms, 19:12293 (R;US)

North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center
Nitrous oxide emissions: Topical report, July 1, 1990–June 30, 1993, 19:11502 (R;US)
Task 3.0: Advanced power systems: Semi-annual report, April 1–June 30, 1993, 19:11986 (R;US)
Task 4.0 – Advanced fuel forms and co-products: Semi-Annual report, April 1–June 30, 1993, 19:11413 (R;US)

Northeastern Univ., Boston, MA (United States)
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: Fifth quarterly project status report, 1 October 1993–30 December 1993, 19:12101 (R;US)

Northeastern Univ., Boston, MA (United States). Barnett Inst. of Chemical Analysis and Materials Science
The separation of DNA by pulsed field capillary electrophoresis: Progress report, August 1, 1992–December 31, 1993, 19:13142 (R;US)

Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy
Analysis of the high energy behavior of the forward scattering parameters – σ_{tot}, ρ, and B, 19:13516 (R;US)
Energetics, bonding mechanism and electronic structure of ceramic/ceramic and metal/ceramic interfaces: Annual progress report, April 1, 1993–March 31, 1994, 19:13882 (R;US)

Notre Dame Univ., IN (United States)
Photocatalytic oxidation of 4-chlorophenol on titanium dioxide: A comparison with γ-radiolysis, 19:12685 (R;US)

Notre Dame Univ., IN (United States). Radiation Lab.
Radiation Laboratory, University of Notre Dame: Quarterly report, October 1–December 31, 1993, 19:12691 (R;US)

Nuclear Electric plc, Barnwood (United Kingdom)
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Nuclear Energy Agency, 75 - Paris (France)
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Budget and Analysis
Budget estimates fiscal year 1995: Volume 10, 19:12300 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering
Crack-arrest tests on two irradiated high-copper welds: Phase 2: Results of duplex-type experiments, 19:12532 (R;US)
Managing aging in nuclear power plants: Insights from NRC maintenance team inspection reports, 19:12273 (R;US)
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TR-EDB: Test Reactor Embrittlement Data Base, Version 1, 19:12244 (R;US)
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Fuel Cycle Safety and Safeguards
Safety Evaluation Report for the Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070), 19:11609 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications
Application of an infiltration evaluation methodology to a hypothetical low-level waste disposal facility: Volume 1, 19:11722 (R;US)
Characterization of Class A low-level radioactive waste 1986–1990: Volume 1: Executive summary, 19:11724 (R;US)
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User's guide for simplified computer models for the estimation of long-term performance of cement-based materials, 19:11723 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Material Safety and Safeguards
Final Safety Evaluation Report to license the construction and operation of a facility to receive, store, and dispose of 11e.(2) byproduct material near Clive, Utah (Docket No. 40-8989), 19:11720 (R;US)
Licensed fuel facility status report: Inventory difference data, July 1, 1992–June 30, 1993: Volume 13, 19:11653 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Office of Nuclear Regulatory Research
Assessment of a pressurizer spray valve faulty opening transient at Asco Nuclear Power Plant with RELAP5/MOD2: International Agreement Report, 19:12277 (R;US)
Assessment of RELAP5/MOD3 with the LOFT L9-1/L3-3 experiment simulating an anticipated transient with multiple failures, 19:12141 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Program Management, Policy Development and Analysis Staff
Status of safety issues at licensed power plants: TMI Action Plan requirements; unresolved safety issues; generic safety issues; other multiplant action issues: Supplement 3, 19:12272 (R;US)

Nuklear-Chemie und -Metallurgie GmbH (NUKEM), Hanau (Germany)
Corrosion data base for the fuel cycle (phase 2): Final report, 19:14278 (R;DE;In German)

O

Oak Ridge Health Agreement Steering Panel, TN (United States)
Tennessee Health Studies Agreement annual report, January 1, 1993–September 30, 1993, 19:11835 (R;US)

Oak Ridge Inst. for Science and Education, TN (United States)
Medical Sciences Division Oak Ridge Institute for Science and Education report for 1992, 19:13146 (R;US)

Oak Ridge K-25 Site, TN (United States)
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Oak Ridge National Lab., TN (United States)
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Toxicological benchmarks for screening of potential contaminants of concern for effects on aquatic biota on the Oak Ridge Reservation, Oak Ridge, Tennessee: Environmental Restoration Program ESD Publication 3940, 19:13122 (R;US)
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Travel to England and Scotland to present two papers on electron microscopy at the Electron Microscopy and Analysis (EMAG) '93 Conference, and University of Glasgow and the University of Birmingham: Foreign trip report, September 13–26, 1993, 19:12659 (R;US)
Travel to France to attend the Specialists Meeting and Irradiation Embrittlement and Optimization of Annealing: Foreign trip report, September 18–29, 1993, 19:12177 (R;US)
Travel to France to participate in the Tore Supra steering committee meeting: Foreign trip report, November 12, 1993–November 24, 1993, 19:14195 (R;US)
Travel to Japan to attend and present a paper at the Fifth Toki Conference on Plasma Physics and Controlled Nuclear Fusion: Foreign trip report, November 14–20, 1993, 19:14063 (R;US)

Travel to Switzerland and Germany to participate in WA98 at CERN and WA98 meeting in Darmstadt: Foreign trip report, November 7–28, 1993, 19:12975 (R;US)
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Oak Ridge Y-12 Plant, TN (United States)
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Oceanit Labs., Inc., Honolulu, HI (United States)
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Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States)
Quality assurance plan for the Close Support Laboratory for the remedial investigation at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 19:12658 (R;US)

Oklahoma State Univ., Stillwater, OK (United States)
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Oklahoma Univ., Norman, OK (United States)
Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: Annual report, July 12, 1991–September 12, 1992, 19:11533 (R;US)
Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: [Quarterly] report, July 12, 1993–October 12, 1993, 19:11539 (R;US)
Dispersion measurement as a method of quantifying geologic characterization and defining reservoir heterogeneity: Annual report, July 12, 1992–July 12, 1993, 19:11540 (R;US)

Oklahoma Univ., Norman, OK (United States). Dept. of Botany and Microbiology
Effect of community structure on the kinetics of anaerobic degradation of aromatic compounds: Progress report, March 1989–June 1991, 19:11898 (R;US)

Oklahoma Univ., Norman, OK (United States). School of Petroleum and Geological Engineering
Fracturing fluid characterization facility (FFCF), 19:11591 (R;US)

Oregon Dept. of Fish and Wildlife, Corvallis, OR (United States)
Umatilla River Basin Trap and Haul Program annual report 1993, 19:11939 (R;US)

Oregon Dept. of Fish and Wildlife, Portland, OR (United States)
Oregon Trust Agreement Planning Project: Potential mitigations to the impacts on Oregon wildlife resources associated with relevant mainstem Columbia River and Willamette River hydroelectric projects, 19:11938 (R;US)

Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center
Geothermal direct-heat utilization assistance: Quarterly report, July–September 1993, 19:11955 (R;US)

Oregon Natural Heritage Program, OR (United States)
Oregon Trust Agreement Planning Project: Potential mitigations to the impacts on Oregon wildlife resources associated with relevant mainstem Columbia River and Willamette River hydroelectric projects, 19:11938 (R;US)

Oregon State Univ., Corvallis, OR (United States)
Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, January 1, 1992–March 31, 1992, 19:11442 (R;US)
Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, April 1, 1992–June 30, 1992, 19:11443 (R;US)
Fundamental studies of catalytic processing of synthetic liquids: Quarterly progress report, April 1, 1991–June 30, 1991, 19:11441 (R;US)

Oregon State Univ., Corvallis, OR (United States). Oregon Cooperative Fishery Research Unit
Research to identify effective antifungal agents: Annual report 1993, 19:11933 (R;US)

Oregon Univ., Eugene, OR (United States). Dept. of Chemistry
Highly excited molecular spectra: Progress report, January 1, 1992–December 31, 1992, 19:13834 (R;US)

Oulu Univ. (Finland)
Carbon dioxide abatement as a differential game, 19:12319 (R;FI)

Oulu Univ. (Finland). Research Inst. of Northern Finland
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Pacific Northwest Lab., Richland, WA (United States)
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Hanford Integrated Planning Process: 1993 Hanford Site-specific science and technology plan, 19:11841 (R;US)
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Papaya Products of Hawaii, Keaau, HI (United States)
Community Geothermal Technology Program: Fruit drying with geothermal energy: Final report, 19:11964 (R;US)

ParaMagnetic Logging, Inc., Woodinville, WA (United States)
Fabrication and downhole testing of moving through casing resistivity apparatus: [Quarterly] report, July 1, 1993–September 30, 1993, 19:11534 (R;US)

Parana Univ., Curitiba, PR (Brazil). Curso de Pos-Graduacao em Fisica
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Paris-11 Univ., 91 - Orsay (France)
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Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire
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Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire
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Peer Consultants, Inc., Oak Ridge, TN (United States)
Quality assurance plan for the Close Support Laboratory for the remedial investigation at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 19:12658 (R;US)

Pennsylvania State Univ., University Park, PA (United States)
In-situ characterization of growth and interfaces in a-Si:H devices: Annual subcontract report, 1 May 1992–30 April 1993, 19:11949 (R;US)

Pennsylvania State Univ., University Park, PA (United States). Coal and Organic Petrology Labs.
Establishment and maintenance of a coal sample bank and data base: Final report, April 8, 1988–September 28, 1993, 19:11505 (R;US)

Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering
Semiconductor electrochemistry of coal pyrite: Technical progress report, July–September 1993, 19:12676 (R;US)

Semiconductor electrochemistry of coal pyrite: Quarterly technical progress report, July–September 1993, 19:11482 (R;US)

Pittsburgh Univ., PA (United States)
[Studies of the fundamental nature of catalytic acidity, sites and intermediates]: Final performance (technical progress) report, 19:12673 (R;US)

Princeton Univ., NJ (United States). Dept. of Chemical Engineering
[Molecular interactions in dilute supercritical mixtures: Molecular dynamics investigation]: Final technical report, December 1, 1990–August 31, 1993, 19:13879 (R;US)

Princeton Univ., NJ (United States). Dept. of Chemistry
Analysis of forward and inverse problems in chemical dynamics and spectroscopy: Progress performance report, November 1, 1992–October 31, 1993, 19:12705 (R;US)

Princeton Univ., NJ (United States). Joseph Henry Labs.
Development and application of photosensitive device systems to studies of biological and organic materials: Progress report, January 1, 1993–December 31, 1993, 19:12935 (R;US)

Princeton Univ., NJ (United States). Plasma Physics Lab.
Are the invariance principles really truly Lorentz covariant?, 19:13474 (R;US)
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Process Technology, Inc., Calumet, MI (United States)
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Radian Corp., Austin, TX (United States)
Field study of disposed solid wastes from advanced coal processes: Annual report, October 1, 1992–September 30, 1993, 19:11490 (R;US)

Radiation Effects Research Foundation, Hiroshima (Japan)
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Raytheon Services Nevada, Las Vegas, NV (United States)
Tomographic data developed using the ABEM RAMAC borehole radar system at the Mixed Waste Landfill Integrated Demonstration, 19:11834 (R;US)

Rensselaer Polytechnic Inst., Troy, NY (United States). Dept. of Chemical Engineering
Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, August 1, 1992–July 30, 1993, 19:13139 (R;US)

Research Inst. of Scripps Clinic, La Jolla, CA (United States). Dept. of Cell Biology
[Genetic engineering with a gene encoding a soybean storage protein to identify DNA sequences to control its expression]: Annual report, 1993, 19:13140 (R;US)

Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States)
CASCADER: An m-chain gas-phase radionuclide transport and fate model: Volume 2, User's manual for CASCADR8, 19:13070 (R;US)
Hydrogeologic data for existing excavations and the Area 5 Radioactive Waste Management Site, Nevada Test Site, Nye County, Nevada, 19:11686 (R;US)
Operational air sampling report: [Semiannual report], January 1–June 30, 1993, 19:13038 (R;US)

Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Waste Operations Dept.
CASCADER: An M-chain gas-phase radionuclide transport and fate model: Volume 4 – Users guide to CASCADR9, 19:11799 (R;US)

Risoe National Lab., Roskilde (Denmark)
MOHAWC. Models of human activities in work contexts, 19:12189 (R;DK)

Risoe National Lab., Roskilde (Denmark). Materials Dept.
Decommissioning of the Risoe Hot Cell facility: 6. Periodic report covering January 1 to June 30, 1993, 19:13315 (R;DK)

Risoe National Lab., Roskilde (Denmark). Systems Analysis
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Rochester Univ., NY (United States)
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San Francisco State Univ., CA (United States). Dept. of Physics and Astronomy
Research in theoretical high-energy physics: Progress report, September 1992–September 1993, 19:13489 (R;US)

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Travel to Germany to attend the 44th Aeroballistics Range Association (ARA) meeting: Foreign trip report, September 11, 1993–September 25, 1993, 19:12761 (R;US)
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The history of NATO TNF policy: The role of studies, analysis and exercises conference proceedings: Volume 3: Papers by Gen. Robert C. Richardson III (Ret.), 19:12328 (R;US)
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Sao Paulo Univ., Piracicaba, SP (Brazil). Escola Superior de Agricultura Luiz de Queiroz
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Sao Paulo Univ., SP (Brazil). Inst. de Fisica
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Science Applications International Corp., Englewood, CO (United States). Foreign Systems Research Center
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Science Applications International Corp., Las Vegas, NV (United States)
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Science Applications International Corp., Oak Ridge, TN (United States)
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Secretariat d'Etat a la Recherche, Algiers (Algeria)
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Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France)
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Sociedade Brasileira de Zoologia, Curitiba, PR (Brazil)
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Sofia Univ. (Bulgaria). Fizicheski Fakultet
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Solar Turbines, Inc., San Diego, CA (United States)
High performance steam cogeneration (proof-of-concept phases): Phase 2, HRSG 500-hour test report: Final report, 19:12411 (R;US)

Solar Turbines, Inc., San Diego, CA (United States). Product Development Center
Advanced turbine systems program: Conceptual design and product development: Topical report, November 1993, 19:11597 (R;US)

Sotia Group, Dallas, TX (United States)
Reserves in Western Basins, 19:11585 (R;US)

South Carolina Univ., Columbia, SC (United States)
South Carolina DOE/EPSCoR energy-related research development grant: Final report addendum, 30 September, 1992–29 March, 1993, 19:12313 (R;US)

South Carolina Univ., Columbia, SC (United States). Savannah River Archaeological Research Program
Annual review of cultural resource investigations by the Savannah River Archaeological Research Program: Fiscal year 1993, 19:12299 (R;US)

Southeastern Consortium for Minorities in Engineering, Atlanta, GA (United States)
Establishing the SECME Model in the District of Columbia: Quarterly report, September 1, 1993–December 31, 1993, 19:12298 (R;US)

Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes
Analyzing organic sulfur in coal/char: Integrated mild degradation/XANES methods: [Quarterly] technical report, September 1–November 30, 1993, 19:11462 (R;US)

Southern States Energy Board, Atlanta, GA (United States)
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Spire Corp., Bedford, MA (United States)
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Stanford Linear Accelerator Center, Menlo Park, CA (United States)
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Proceedings of the 1992 workshops on high-energy physics with colliding beams: Volume 3, Electroweak symmetry breaking at colliding-beam facilities, 19:13515 (R;US)
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Stanford Univ., CA (United States)
Structure and modelling of the three-dimensional boundary layer on a rotating disk: Progress report, 19:12777 (R;US)

Stanford Univ., CA (United States). Dept. of Chemistry
Degenerate four-wave mixing as a diagnostic of plasma chemistry: Progress report, September 15, 1992–March 15, 1993, 19:12599 (R;US)

Stanford Univ., CA (United States). Stanford Geothermal Program
Transient adsorption experiment: Salinity and noncondensible gas effects: Quarterly report, July–September 1993, 19:11957 (R;US)

Stanford Univ., CA (United States). Stanford Synchrotron Radiation Lab.
Anisotropic phase separation through the metal-insulator transition in amorphous Mo-Ge and Fe-Ge alloys, 19:12623 (R;US)
Anomalous small angle x-ray scattering studies of amorphous metal-germanium alloys, 19:12624 (R;US)

State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center
Solar resource: Utility load-matching assessment: Interim subcontract report, 20 September 1991–19 December 1993, 19:11941 (R;US)

State Univ. of New York, Binghamton, NY (United States). Dept. of Chemistry
Magnetic relaxation – coal swelling, extraction, pore size: Quarterly technical progress report, October 1, 1993–December 31, 1993, 19:11481 (R;US)

State Univ. of New York, Stony Brook, NY (United States)
Ionization probes of molecular structure and chemistry: Progress report, January 15, 1993–January 14, 1994, 19:13838 (R;US)

State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics
Double-γdecay of the electromagnetically excited double giant dipole resonance in ^{208}Pb, 19:13676 (R;DE)

Stockholm Univ. (Sweden). Dept. of Physics
Calculation of inelastic mean free path and stopping power for electrons in solids from an optical-data model, 19:13827 (R;SE)

Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires
Comparison of final states from e^+e^-, IN, IA, pp, pA and AA' collisions, 19:13563 (R;FR)
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Stuttgart Univ. (Germany). Inst. fuer Anorganische Chemie
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Stuttgart Univ. (Germany). Staatliche Materialpruefungsanstalt
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Suo Oy, Oulu (Finland)
Potential large-scale targets of use of peat from the point of view of peat production, 19:11508 (R;FI;In Finnish)

Surface Combustion, Inc., Maumee, OH (United States)
Ferrous scrap preheating system: Phase 2, Final report, 19:12412 (R;US)

Surtek, Inc., Golden, CO (United States)
Detailed evaluation of the West Kiehl alkaline-surfactant-polymer field project and it's application to mature Minnelusa waterfloods: Technical progress report, July–September 1993, 19:11543 (R;US)

Sweden
Alterations in the atomic energy laws, 19:14285 (I;SE;In Swedish)

Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden)
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Swedish Nuclear Power Inspectorate, Stockholm (Sweden)
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Swedish Radiation Protection Inst., Stockholm (Sweden)
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Swedish Univ. of Agricultural Sciences, Uppsala (Sweden). Dept. of Radioecology
Project 'Agricultural research after Chernobyl'. Activity 1991-92, 19:13101 (R;SE;In Swedish)

Syncal Corp., Sunnyvale, CA (United States)
Silicon-germanium/gallium phosphide material in high power density thermoelectric modules: Final report, February 1980–September 1981, 19:12353 (R;US)

Syracuse Univ., NY (United States). Dept. of Physics
Fusion with highly spin polarized HD and D_2: Final report, December 14, 1991–June 30, 1993, 19:14139 (R;US)

T

Tampella Power Corp., Williamsport, PA (United States)
Toms Creek integrated gasification combined cycle demonstration project: Quarterly report, July 1–September 30, 1993, 19:11985 (R;US)

Technical Research Centre of Finland, Espoo (Finland)
New alternatives for electricity production: Performance of peat-fuelled air gasification combined-cycle power plants, 19:12036 (R;FI)
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Thermal coupling of leakage air and heat flows in buildings and in building components: Development and application of numerical methods, 19:12408 (R;FI)

Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering
Application of knowledge-based technology to energy management systems in the steel and base metals industry: Final report, 19:12439 (R;FI;In Finnish)

Technical Research Centre of Finland, Jyvaeskylae (Finland). Combustion and Thermal Engineering Lab.
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Technische Hochschule Aachen (Germany)
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Technische Univ. Berlin (Germany). Fachbereich 4 - Physik
Spectroscopy of simple shell model states in ^{208}Pb, 19:13680 (R;DE;In German)

Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik
Representation of critical heat flux in rod bundles, 19:12771 (I;DE;In German)

Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik
Antiproton production in heavy-ion collisions at energies below the threshold, 19:13767 (R;DE;In German)
Transient magnetic fields of H-like ions in the range $10 \leq Z_{ion} \leq 28$, 19:13840 (R;DE;In German)

Technische Univ. Muenchen, Garching (Germany). Inst. fuer Radiochemie
Colloid migration in groundwaters: Geochemical interactions of radionuclides with natural colloids: 2nd progress report. Period covered: May 1991 - May 1992, 19:11741 (R;DE)

Tennessee Dept. of Health, Nashville, TN (United States). Div. of Environmental Epidemiology
Oak Ridge Health Studies phase 1 report, Volume 1: Oak Ridge Phase 1 overview, 19:11836 (R;US)

Tennessee Univ., Knoxville, TN (United States)
Neutron fluence calculations for the SDC detector and the results of codes comparison, 19:12922 (R;US)

Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry
Boron in nuclear medicine: New synthetic approaches to PET and SPECT: Progress report, May 1, 1993–April 30, 1994, 19:13156 (R;US)

Texas Tech Univ., Lubbock, TX (United States)
Metal ion complexation by ionizable crown ethers: Progress report, January 1, 1991–December 31, 1993, 19:12640 (R;US)

Texas Tech Univ., Lubbock, TX (United States). Pulsed Power Lab.
High power switch design for the Nova upgrade laser (Project Hercules): Final report, August 15, 1991–May 31, 1993, 19:12820 (R;US)

Texas Univ., Austin, TX (United States). Bureau of Economic Geology
Consolidation of geologic studies of geopressured-geothermal resources in Texas: Barrier-bar tidal-channel reservoir facies architecture, Jackson Group, Prado field, South Texas: Final report, 19:11536 (R;US)
Geothermal and heavy-oil resources in Texas, 19:11553 (R;US)
Hydrogeochemical and production controls on NORM in oil- and gas- field operations: Technical progress report, January 1, 1993–March 31, 1993, 19:11575 (R;US)

Texas Univ., Austin, TX (United States). Center for Particle Physics
Research program in particle physics: Progress report, January 1, 1993–December 1993, 19:13490 (R;US)

Texas Univ., Austin, TX (United States). Dept. of Petroleum Engineering
Reservoir engineering studies of the Gladys McCall geopressured-geothermal resource: Final report, 19:11587 (R;US)

Texas Univ., Austin, TX (United States). Dept. of Physics
Quantum dynamics in dual spaces, 19:13352 (R;US)

Texas Univ., Austin, TX (United States). Inst. for Fusion Studies
Anomalous thermalization of fast ions in magnetized plasma, 19:13935 (R;US)
Basic principles approach for studying nonlinear Alfven wave-alpha particle dynamics, 19:13936 (R;US)
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Transport suppression by shear flow generation in multihelicity resistive-g turbulence, 19:13934 (R;US)

Texas Univ., Austin, TX (United States). Nuclear Engineering Teaching Lab.
Study of neutron focusing at the Texas Cold Neutron Source: Progress report, 19:13813 (R;US)

Texas Univ., Richardson, TX (United States). Dept. of Physics
Elementary particle physics: Progress report, July 1993–January 1994, 19:13586 (R;US)

Textron, Inc., Everett, MA (United States). Textron Defense Systems
Advanced coal-fueled gas turbine systems: Subscale combustion testing: Topical report, Task 3.1, 19:11516 (R;US)

Thompson (T.K.), Inc., White Rock, NM (United States)
Conceptual process description of M division incinerator project, 19:12783 (R;US)

Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study
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Trondheim Univ. (Norway)
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Trondheim Univ. (Norway). Norges Tekniske Hoegskole
Coalescence in dense water/oil dispersions, 19:11560 (R;NO)
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Snow and glacier ice characteristics measured using Landsat TM data, 19:13056 (R;NO)

TRW, Inc., Fairfax, VA (United States)
Yucca Mountain Site Characterization Project Technical Data Catalog (Quarterly supplement), 19:11692 (R;US)

TSI Research, Inc., Solana Beach, CA (United States)
Neutronics and nuclear data requirement for fusion reactors: [Annual] performance report, July 1992–August 1993, 19:14134 (R;US)

Tsukuba Univ., Ibaraki (Japan). Tandem Accelerator Center
Annual report of the Tandem Accelerator Center, University of Tsukuba: April 1, 1992 - March 31, 1993., 19:14228 (R;JP)

Tulsa Univ., OK (United States)
Integrated approach towards the application of horizontal wells to improve waterflooding performance: [Quarterly report], July 1–September 30, 1993, 19:11548 (R;US)

Tulsa Univ., OK (United States). Dept. of Chemical Engineering
Volatiles combustion in fluidized beds: Quarterly technical progress report, September 4, 1993–December 3, 1993, 19:12707 (R;US)

U

United Nations Environmental Programme
Manual for the classification and prioritization of risks due to major accidents in process and related industries: Inter-Agency programme on the assessment and management of health and environmental risks from energy and other complex industrial systems, 19:12315 (R;XA)

United Nations Industrial Development Organization, Vienna (Austria)
Manual for the classification and prioritization of risks due to major accidents in process and related industries: Inter-Agency programme on the assessment and management of health and environmental risks from energy and other complex industrial systems, 19:12315 (R;XA)

United Nations, New York, NY (USA)
Documents of the first committee. Note by the Secretariat. Addendum: General Assembly 48. session, first committee, 19:12462 (I;XU)
Nuclear non-Proliferation treaty: Speech to a joint session of Parliament, 24 March 1993, 19:12464 (IA;XU)
Process of nuclear disarmament in the framework of international peace and security, with the objective of the elimination of nuclear weapons. Regional approach to disarmament within the context of global security: General assembly. Disarmament Commission, 1993 substantive session, New York, 19 April-10 May 1993. Agenda items 4 and 5, 19:12463 (I;XU)
Resolution 825 (1993). Adopted by the Security Council at its 3212th meeting, on 11 May 1993, 19:12461 (I;XU)

United Solar Systems Corp., Troy, MI (United States)
Research on stable, high-efficiency amorphous silicon multijunction modules: Semiannual subcontract report, 1 March 1993–30 November 1993, 19:11948 (R;US)

Universidade Estadual de Campinas, SP (Brazil). Inst. de Biologia
Study of a bacterial leaching program for uranium ores by Thiobacillus ferroxidans, 19:11608 (I;BR;In Portuguese)

Universidade Estadual de Campinas, SP (Brazil). Inst. de Matematica, Estatistica e Ciencia da Computacao
Micro-universes and strong black-roles: a purely geometric approach to elementary particles, 19:13475 (R;BR)

Universidade Federal, Rio de Janeiro, RJ (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia
Linear dynamic analysis of arbitrary thin shells modal superposition by using finite element method, 19:12173 (I;BR;In Portuguese)
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Universidade Federal, Rio de Janeiro, RJ (Brazil). Inst. de Fisica
Isomeric rations study for the $\alpha + {}^{70}$Ge, 19:13702 (I;BR;In Portuguese)
Thermalization in high energy proton-nucleus collisions, 19:13771 (I;BR;In Portuguese)

Universities Research Association, Waxahachie, TX (United States)
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University of Southern California, Los Angeles, CA (United States)
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University of Southern California, Los Angeles, CA (United States). Dept. of Chemistry
Combustion-related studies using weakly-bonded complexes, 19:12706 (R;US)

University of Tennessee Medical Center, Knoxville, TN (United States). Dept. of Radiology
Molecular medicine: Synthesis and in vivo detection of agents for use in neutron capture therapy: Progress report, May 1, 1993–April 30, 1994, 19:13157 (R;US)

University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst.
The use of coal fly ash for soil stabilization, 19:12415 (R;US)

UOP, Inc., Des Plaines, IL (United States)
Development of an extraction process for removal of heteroatoms from coal liquids: Technical progress report No. 6, 1 July, 1993–30 September, 1993, 19:11446 (R;US)

USAEC Waste Management Advisory Board, Richland, WA (United States)
Hanford radioactive waste management plans, 19:11670 (R;US)

USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office
Waste Isolation Pilot Plant Groundwater Protection Management Program Plan, 19:13075 (R;US)

USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office
Waste Isolation Pilot Plant annual site environmental report for calendar year 1992, 19:11695 (R;US)

USDOE Assistant Secretary for Defense Programs, Washington, DC (United States)
Assessment of plutonium storage safety issues at Department of Energy facilities, 19:11635 (R;US)

USDOE Assistant Secretary for Defense Programs, Washington, DC (United States). Safety Diagnostic Div.
Emergency and backup power supplies at Department of Energy facilities: Augmented Evaluation Team – Final report, 19:12330 (R;US)

USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States)
Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999, 19:11584 (R;US)

USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States)
Department of Energy Construction Safety Reference Guide, 19:13324 (R;US)
Department of Energy Hoisting and Rigging Manual, 19:13325 (R;US)

USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance
Excluded USTs: RCRA Subtitle 1, Underground Storage Tanks, 19:11580 (R;US)
Inspections of RCRA container storage areas, 19:11675 (R;US)
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Occupational dose reduction at Department of Energy contractor facilities: Bibliography of selected readings in radiation protection and ALARA; Volume 5, 19:13227 (R;US)
Summary of radionuclide air emissions from Department of Energy facilities for CY 1992, 19:13034 (R;US)

USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). RCRA/CERCLA Div.
Closure of municipal solid waste landfills (MSWLFs): RCRA Information Brief, 19:12443 (R;US)
Delay of closure for RCRA hazardous waste management facilities: RCRA Information Brief, 19:11673 (R;US)
Exclusions and exemptions from RCRA hazardous waste regulation: RCRA Information Brief, 19:12306 (R;US)
Ground-water monitoring under RCRA: RCRA Information Brief, 19:12308 (R;US)
Hazardous substance USTs: RCRA Subtitle 1, Underground Storage Tanks: RCRA Information Brief, 19:11578 (R;US)
Petroleum USTs: RCRA Subtitle 1, Underground Storage Tanks: RCRA Information Brief, 19:11581 (R;US)
RCRA and CERCLA requirements associated with the sale or transfer of DOE property: CERCLA Information Brief, 19:12304 (R;US)
RCRA corrective action permit requirements and modifications under Subpart F regulations: RCRA Information Brief, 19:12303 (R;US)
RCRA corrective action permit requirements and modifications under proposed Subpart S rule: RCRA Information Brief, 19:12305 (R;US)
RCRA post-closure permits: RCRA Information Brief, 19:12302 (R;US)
Remedial Investigation/Feasibility Study (RI/FS) process, elements and techniques guidance, 19:12310 (R;US)
Requirements for satellite accumulation areas: RCRA Information Brief, 19:11674 (R;US)
The "Derived-from" rule under the Resource Conservation and Recovery Act (RCRA): RCRA Information Brief, 19:12307 (R;US)

USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Office of Environmental Restoration
Implementation Plan: Environmental Restoration and Waste Management Programmatic Environmental Impact Statement, 19:12311 (R;US)
Implementation plan: Executive summary: Environmental restoration and waste management programmatic environmental impact statement, 19:12312 (R;US)
Technical review of Molten Salt Oxidation, 19:11676 (R;US)

USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States)
Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999, 19:11584 (R;US)

USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Planning and Environment
The directory of United States coal & technology export resources: Profiles of domestic US corporations, associations and public entities, nationwide, which offer products or services suitable for export, relating to coal and its utilization, 19:11529 (R;US)

USDOE Assistant Secretary for Policy, Planning and Program Evaluation, Washington, DC (United States)
Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999, 19:11584 (R;US)

USDOE Bartlesville Project Office, OK (United States)
Contracts for field projects and supporting research on enhanced oil recovery: Progress review No. 74, Quarter ending March 31, 1993, 19:11538 (R;US)

USDOE Bonneville Power Administration, Portland, OR (United States)
1993 Pacific Northwest Loads and Resources Study, Pacific Northwest economic and electricity use forecast: Technical appendix: Volume 1, 19:12340 (R;US)
Bonneville Power Administration final draft Strategic Marketing Plan, February 1994, 19:12339 (R;US)
Coyote Springs Cogeneration Project, Morrow County, Oregon: Draft Environmental Impact Statement, 19:12288 (R;US)
Daily/hourly hydrosystem operation: How the Columbia River system responds to short-term needs, 19:11921 (R;US)

Lighting, 19:12396 (R;US)
Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Volume 2: Public involvement, 19:12301 (R;US)
Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Summary, 19:12105 (R;US)
Proposed Tenaska Washington II Generation Project: Final Environmental Impact Statement: Volume 1: Environmental analysis and technical appendices, 19:12106 (R;US)
Research and development report, Fiscal year 1991 and 1992, 19:12284 (R;US)

USDOE Bonneville Power Administration, Portland, OR (United States). Div. of Fish and Wildlife
Columbia River Basin Fish and Wildlife Program Annual Implementation Work Plan for fiscal year 1993, 19:13131 (R;US)

USDOE Energy Information Administration, Washington, DC (United States)
Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999, 19:11584 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and Alternate Fuels
Electric power monthly, February 1994, 19:12341 (R;US)
Financial statistics of major US publicly owned electric utilities 1992, 19:12342 (R;US)
Quarterly coal report, July–September 1993, 19:11506 (R;US)
State coal profiles, January 1994, 19:11504 (R;US)
Uranium purchases report 1992, 19:11655 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use
International petroleum statistics report, February 1994, 19:11567 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Integrated Analysis and Forecasting
Proceedings of the National Energy Modeling System Conference, 19:12296 (R;US)

USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas
Distillate Market Model documentation report, 19:14242 (R;US)
Natural gas monthly, February 1994, 19:11596 (R;US)
Oil and gas resources of the Fergana basin (Uzbekistan, Tadzhikistan, and Kyrgyzstan): Advance summary, 19:11535 (R;US)
Petroleum marketing monthly, February 1994, 19:11566 (R;US)
Petroleum supply monthly, February 1994, 19:11565 (R;US)
Propane Market Model documentation report, 19:14241 (R;US)
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USDOE Environmental Measurements Lab., New York, NY (United States)
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USDOE Morgantown Energy Technology Center, WV (United States)
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USDOE Office of Arms Control and Nonproliferation, Washington, DC (United States)
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USDOE Office of Energy Research, Washington, DC (United States)
Natural Gas Strategic Plan and Multi-Year Program Crosscut Plan, FY 1994–1999, 19:11584 (R;US)

USDOE Office of Energy Research, Washington, DC (United States). Materials Sciences Div.
Materials research at selected Japanese laboratories: Based on a 1992 visit: Overview, summary of highlights, notes on laboratories and topics, 19:12473 (R;US)

USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States)
Site maps and facilities listings, 19:11677 (R;US)
US Department of Energy's Federal Facility Compliance Act Chief Financial Officer's Report to Congress for fiscal year 1993, 19:11678 (R;US)

USDOE Office of Inspector General, Oak Ridge, TN (United States). Eastern Regional Audit Office
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USDOE Office of Inspector General, Washington, DC (United States)
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USDOE Office of Inspector General, Washington, DC (United States). Office of Assistant Inspector General for Audits
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USDOE Office of Inspector General, Washington, DC (United States). Office of Inspections
Inspection of selected intelligence and special access program work-for-others projects, 19:14216 (R;US)

USDOE Pittsburgh Energy Technology Center, PA (United States)
Method of and system for producing electrical power, 19:12352 (PA;US)

Trip to Japan to participate in the Eighth Coordinating Committee Meeting in Coal Energy Research and Development: Foreign trip report, October 12, 1993, 19:11421 (R;US)

USDOE Richland Operations Office, WA (United States)
303-K Storage Facility closure plan: Revision 2, 19:11688 (R;US)
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USDOE Southwestern Power Administration, Tulsa, OK (United States)
Southwestern Power Administration 1993 annual report, 19:12343 (R;US)

USDOE, Washington, DC (United States)
Clean Coal Technology: Reduction of NO_x and SO_2 using gas reburning, sorbent injection, and integrated technologies: Topical report No. 3, Revision 1, 19:12052 (R;US)
Making contracting work better and cost less: Report of the Contract Reform Team, 19:12332 (R;US)
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Total quality management implementation guidelines, 19:14212 (R;US)
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Utah Univ., Salt Lake City, UT (United States)
Fabrication, phase transformation studies and characterization of SiC-AlN-Al_2OC ceramics: [Annual report, February 1, 1993–July 30, 1993], 19:12569 (R;US)
Laser flash photolysis, EPR and raman studies of liquids at elevated pressures: Progress report, April 1, 1993–November 19, 1993, 19:12675 (R;US)
New concept for coal wettability evaluation and modulation: Technical progress report, October 1, 1993–December 31, 1993, 19:11489 (R;US)
The hydrophobic character of nonsulfide mineral surfaces as influenced by double-bond reactions of adsorbed unsaturated collector species: Progress report, 15 December 1992–14 December 1993, 19:12641 (R;US)

Utah Univ., Salt Lake City, UT (United States). Dept. of Chemistry
Time-resolved analytical methods for liquid/solid interfaces: Progress report, March 1, 1993–November 15, 1993, 19:12674 (R;US)

Utility Power Group, Chatsworth, CA (United States)
Amorphous silicon photovoltaic maufacturing technology, Phase 2A: Annual subcontract report, 1 May 1992–30 April 1993, 19:11946 (R;US)

V

Vienna Univ. (Austria). Inst. fuer Theoretische Physik
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Viet Nam National Atomic Energy Commission, Ha Noi (Viet Nam)
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Production of amorphous metal layers using ion implantation and investigation of the related modification of some surface properties, 19:12551 (R;VN)

Viking Systems International, Inc., Pittsburgh, PA (United States)
Investigation of coal structure: Quarterly report No. 7, October 1, 1993–December 31, 1993, 19:11479 (R;US)

Vissh Massinno-Elektrotekhnicheski Inst., Sofia (Bulgaria)
Aspects of optimization of the means and methods for monitoring of the Kozloduy NPP personnel functional state, 19:12183 (I;BG;In Bulgarian)

Vsesoyuznyj Nauchno-Issledovatel'skij Inst. Fiziko-Tekhnicheskikh i Radiotekhnicheskikh Izmerenij, Moscow (Russian Federation)
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Washington Dept. of Fisheries, Olympia, WA (United States)
Development of laser marking as a mass marking technique: Annual report FY 1993, 19:13194 (R;US)

Washington State Univ., Pullman, WA (United States)
Towards a detailed understanding of the structural variability in lignins: A new approach: Progress report, April 1991–June 1993, 19:11899 (R;US)
[Particle dispersion by ordered motion in mixing layers]: [Annual report], 19:12760 (R;US)
[Regulation of terpene metabolism]: Progress report, [March 15, 1993–March 14, 1994], 19:13138 (R;US)

Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering
Metal induced embrittlement: Annual report, [March 1, 1987–February 29, 1988], 19:12483 (R;US)
Metal induced embrittlement: [Annual report, March 1, 1988–February 28, 1989], 19:12484 (R;US)
Metal induced embrittlement: Annual report, [March 1, 1989–February 28, 1990], 19:12485 (R;US)
Metal induced embrittlement: Annual report, [May 30, 1992–May 31, 1993], 19:12486 (R;US)

Washington State Univ., Richland, WA (United States). Coll. of Pharmacy
Publications of the United States Transuranium and Uranium Registries, 1968–1993: Volume 2, Annual reports, 19:13316 (R;US)

Washington Univ., Seattle, WA (United States)
Near edge x-ray spectroscopy theory: Annual progress report, 1993–1994, 19:13830 (R;US)
[Vertically intergrated analysis of human DNA]: Progress report, [April 1, 1993–February 28, 1994], 19:13144 (R;US)

Washington Univ., Seattle, WA (United States). Aerospace and Energetics Research Program
Coaxial Slow Source: Final technical report, November 16, 1991–November 15, 1993, 19:14133 (R;US)

Washington Univ., Seattle, WA (United States). Dept. of Mechanical Engineering
Suppression of fine ash formation in pulverized coal flames: Quarterly technical progress report No. 5, October 1, 1993–December 31, 1993, 19:12102 (R;US)

Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory
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Large amplitude collective nuclear motion and soliton concept, 19:13663 (R;US)

West Virginia Univ. Research Corp., Morgantown, WV (United States)
The economical production of alcohol fuels from coal-derived synthesis gas: Quarterly technical progress report Number 8, 1 July, 1993–30 September, 1993, 19:11445 (R;US)

West Virginia Univ., Morgantown, WV (United States)
Phase and foam behavior study of CO_2-based foams at reservoir temperature and pressure: Final report, August 20, 1990–July 15, 1993, 19:11554 (R;US)

Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div.
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Westinghouse Electric Corp., Orlando, FL (United States)
Advanced coal-fueled gas turbine systems: Quarterly report, January–March 1993, 19:11517 (R;US)

Westinghouse Electric Corp., Orlando, FL (United States). Power Generation Business Unit
Advanced coal-fueled gas turbine systems: Subscale combustion testing: Topical report, Task 3.1, 19:11516 (R;US)

Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center
Integrated Low Emissions Cleanup system for direct coal fueled turbines, (moving bed, fluid bed contactor/ceramic filter): Twenty-fourth quarterly status report, July–September 1993, 19:12053 (R;US)
Subpilot scale gasifier evaluation of ceramic cross flow filter: Final report, February 1, 1988–December 31, 1992, 19:11422 (R;US)

Westinghouse Hanford Co., Richland, WA (United States)
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Silicon-film™ photovoltaic manufacturing technology: Annual subcontract report, 15 January 1992–15 November 1992, 19:11945 (R;US)

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	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	19:12176	NUREG/CR–5990
	19:12273	NUREG/CR–5812
	19:12275	NUREG/CR–6169
	USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Health	
	19:13227	DOE/EH–0364T
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (United States)**	
	19:12837	FNAL/C–93/174
	19:12838	FNAL/C–93/175
	19:12839	FNAL/C–93/177
	19:12840	FNAL/C–94/019
	19:12841	FNAL/C–94/020
	19:12853	FNAL-TM–1825
	19:12936	DOE/FTR–94003591
	19:12937	FNAL/C–94/018
	19:12938	FNAL/C–94/023-E
	19:12939	FNAL/C–94/030-E
	19:12940	FNAL-TM–1868
	19:12941	FNAL-TM–1875
	19:13491	FNAL/C–93/404-E
	19:13587	DOE/FTR–94003593
	19:13588	FNAL/C–93/207-E
	19:13589	FNAL/C–93/210-E
	19:13590	FNAL/C–93/359-E
	19:13591	FNAL/C–93/362-E
	19:13592	FNAL/C–93/388-E
	19:13593	FNAL/C–93/403-E
	19:13594	FNAL/C–94/016-E
	19:13595	FNAL/C–94/017-E
	19:13596	FNAL/C–94/035-E
	19:13645	CONF-9306258–
	19:13647	FNAL/C–92/261
	19:13648	FNAL/C–94/006-E
	19:13649	FNAL/C–94/014-E
	19:13650	FNAL/C–94/021-E
	19:13651	FNAL/C–94/031
	19:13652	FNAL/C–94/036-E
AC02-76CH03073	**Princeton Univ., NJ (United States). Plasma Physics Lab.**	
	19:13474	PPPL–2957
	19:14064	PPPL–2960
	19:14065	PPPL–2961
	19:14066	PPPL–2962
	19:14067	PPPL–2970
	Lawrence Livermore National Lab., CA (United States)	
	19:14200	UCRL-JC–114266
	19:14201	UCRL-JC–114269
AC02-76ER00038	**Notre Dame Univ., IN (United States)**	
	19:12685	DOE/ER/00038–3676
	Notre Dame Univ., IN (United States). Radiation Lab.	
	19:12691	DOE/ER/00038–3674
AC02-76ER00881	**Argonne National Lab., IL (United States)**	
	19:13516	ANL-HEP-CP–94-9
AC02-76ER02289	**Argonne National Lab., IL (United States)**	
	19:13516	ANL-HEP-CP–94-9
AC02-76ER03075	**Fermi National Accelerator Lab., Batavia, IL (United States)**	
	19:13593	FNAL/C–93/403-E
AC02-78ET51013	**Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center**	
	19:14137	DOE/FTR–94004153
	General Atomics, San Diego, CA (United States)	
	19:13951	GA-A–21541
AC02-78EV04733	**Brookhaven National Lab., Upton, NY (United States)**	
	19:13226	BNL–49779

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AC02-80ER10587	**Fermi National Accelerator Lab., Batavia, IL (United States)**	
	19:13593	FNAL/C–93/403-E
AC02-83CH10093	**Argonne National Lab., IL (United States)**	
	19:11900	DOE/FTR–94003548
	National Renewable Energy Lab., Golden, CO (United States)	
	19:11910	DOE/CH/10093–257
	19:11941	NREL/TP–411-6292
	19:11944	DOE/CH/10093–264
	19:11945	NREL/TP–411-5815
	19:11946	NREL/TP–411-6263
	19:11947	NREL/TP–411-6264
	19:11948	NREL/TP–411-6396
	19:11949	NREL/TP–451-6135
	19:11950	NREL/TP–451-6192
	19:11951	NREL/TP–451-6215
	19:11953	DOE/FTR–94003575
	19:11980	DOE/FTR–94004468
	19:12346	DOE/FTR–94003547
	19:12413	DOE/CH/10093–199
	19:12442	DOE/CH/10093–246
	19:12444	DOE/FTR–94004452
AC02-87CE40812	**Solar Turbines, Inc., San Diego, CA (United States)**	
	19:12411	DOE/CE/40812–1
AC02-88ID12695	**Air Products and Chemicals, Inc., Allentown, PA (United States)**	
	19:12414	DOE/ID/12695–T1
AC02-89CE40874	**Surface Combustion, Inc., Maumee, OH (United States)**	
	19:12412	DOE/CE/40874–4
AC03-76SF00098	**Stanford Linear Accelerator Center, Menlo Park, CA (United States)**	
	19:12825	SLAC–430
	Lawrence Berkeley Lab., CA (United States)	
	19:11463	LBL–35049
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	19:12378	LBL–33819
	19:12401	LBL–32183
	19:12402	LBL–33342
	19:12403	LBL–33587
	19:12404	LBL–33962
	19:12405	LBL–35036
	19:12530	LBL–34991
	19:12531	LBL–35057
	19:12614	LBL–34881
	19:12656	LBL–35155
	19:12843	LBL–35058
	19:12969	LBL–35092
	19:13170	LBL–35050
	19:13193	LBL–30971
	19:13326	LBL–35037
	19:13333	LBL–30043
	19:13334	LBL–30043
	19:13335	LBL–30043
	19:13338	LBL–30043
	19:13427	LBL–90-Rev.
	19:13514	LBL–34911
	19:13897	LBL–34882
	19:13898	LBL–34883
	19:13921	LBL–34880
	19:14261	LBL–31742
AC03-76SF00515	**Stanford Linear Accelerator Center, Menlo Park, CA (United States)**	
	19:12623	SLAC–427
	19:12624	SLAC–434
	19:12825	SLAC–430
	19:12830	SLAC-PUB–6417
	19:12907	SLAC–431
	19:12977	SLAC-PUB–6390
	19:13420	SLAC-PUB–6405
	19:13421	SLAC-PUB–6406
	19:13515	SLAC–428-Vol.3
	19:13628	SLAC–426
	19:13629	SLAC–435
	19:13630	SLAC-PUB–6430
	19:13658	SLAC–424
	19:13659	SLAC-PUB–6328
	19:14270	SLAC–362
AC03-84ER51044	**Lawrence Livermore National Lab., CA (United States)**	
	19:14069	UCRL-ID–116271
AC03-89ER51114	**General Atomics, San Diego, CA (United States)**	
	19:13948	GA-A–21518
	19:13949	GA-A–21520
	19:13950	GA-A–21525
	19:13951	GA-A–21541
	19:13952	GA-A–21554
	19:14161	GA-A–21487
AC03-89ER52153	**General Atomics, San Diego, CA (United States)**	
	19:14162	GA-A–21517
AC03-90SF18758	**Gas-Cooled Reactor Associates, San Diego, CA (United States)**	
	19:12143	DOE-GT-MHR–100002
AC04-76DP00613	**Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div.**	
	19:11705	KCP–613-5236
	19:12428	KCP–613-5307
	19:12715	DOE/FTR–94003539
AC04-76DP00789	**Sandia National Labs., Albuquerque, NM (United States)**	
	19:11742	SAND–93-0817C
	19:12664	SAND–94-8204
	19:12761	DOE/FTR–94002463
	19:12762	DOE/FTR–94004044
	19:12813	PATENTS-US–A7850475
	General Atomics, San Diego, CA (United States)	
	19:13949	GA-A–21520
	19:13951	GA-A–21541
AC04-76DR00789	**Sandia National Labs., Livermore, CA (United States)**	
	19:11758	SAND–94-8207
	19:12328	SAND–91-8010/3
	19:12622	SAND–94-8219
	19:12708	SAND–94-8524
	19:12753	SAND–94-8535
	19:12999	SAND–93-8221
	19:13148	SAND–93-8688
AC04-76EV01013	**Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst.**	
	19:13320	ITRI–140
AC04-86AL31950	**USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office**	
	19:13075	DOE/WIPP–93-022
	Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div.	
	19:11696	DOE/WIPP–94-008
	19:11697	DOE/WIPP–94-009
AC04-88DP43495	**Mound, Miamisburg, OH (United States)**	
	19:13100	MLM–3791
AC04-89AL58309	**Environmental Evaluation Group, Albuquerque, NM (United States)**	
	19:11671	DOE/AL/58309–54

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	19:11672	DOE/AL/62350–100
	19:11826	DOE/AL/62350–53F-Rev.1
	19:11827	DOE/AL/62350–78
	19:11828	DOE/AL/62350–86
	19:11829	DOE/AL/62350–92
	19:11830	DOE/AL/62350–108
	19:11831	DOE/AL/62350–109
	19:11833	DOE/EA–0464-Rev.3
	19:13066	DOE/AL/62350–90D
	19:13067	DOE/AL/62350–97D
	MK-Ferguson Co., Albuquerque, NM (United States)	
	19:11693	DOE/UMTRA–3050-93-1235-Vol.1
	19:11694	DOE/UMTRA–3050-93-1235-Vol.2
AC04-92AL73000	**Martin Marietta Specialty Components, Inc., Largo, FL**	
	19:14247	ESTSC–000610D0VAX00
AC04-94AL85000	**Sandia National Labs., Albuquerque, NM (United States)**	
	19:11510	SAND–93-2566C
	19:11558	SAND–94-0390C
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	19:11752	SAND–93-2441C
	19:11753	SAND–93-2670C
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	19:11757	SAND–94-0658C
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	19:11812	SAND–94-0276C
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	19:11959	SAND–92-1728
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	19:12294	SAND–94-0380C
	19:12323	SAND–93-2004C
	19:12324	SAND–94-0196C
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	19:12434	SAND–93-3961C
	19:12470	SAND–93-2470C
	19:12475	SAND–93-2096
	19:12476	SAND–94-0314
	19:12535	SAND–93-2047C
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	19:12588	SAND–93-3872C
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	19:12742	SAND–93-1526C
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	19:12752	SAND–94-0254C
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	19:13014	SAND–93-1912C
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	19:13030	SAND–93-3967C
	19:13322	SAND–93-2150
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	19:13824	SAND–93-2084C
	19:13825	SAND–93-2085C
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	19:13888	SAND–94-0317C
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	19:13922	SAND–94-0158
	19:14226	SAND–93-4085
	19:14243	DOE/FTR–94004497
	19:14265	SAND–92-1706
	19:14266	SAND–93-2704C
	19:14267	SAND–93-3979C
	19:14268	SAND–93-4088
	19:14269	SAND–93-4104C
AC05-76OR00033	**Oak Ridge National Lab., TN (United States)**	
	19:12566	CONF-9311153–2
	19:12714	CONF-940550–10
	Oak Ridge Inst. for Science and Education, TN (United States)	
	19:13146	ORISE–92/K-61
AC05-84OR21400	**Argonne National Lab., IL (United States)**	
	19:12922	ANL-HEP-CP–94-08
	Brookhaven National Lab., Upton, NY (United States)	
	19:13641	BNL–52389
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	19:11478	CONF-940301–16
	19:11562	ORNL–6751
	19:11573	ORNL–6747
	19:11634	CONF-930749–74
	19:11654	ORNL/TM–12642
	19:11668	CONF-940553–2
	19:11669	CONF-940553–3
	19:11687	DOE/OR–01-1192-D1
	19:11731	ORNL/ER–204
	19:11732	ORNL/M–3022
	19:11808	ORNL/ER–172
	19:11809	ORNL/M–3023
	19:11852	ORNL/ER–164
	19:11853	ORNL/ER–208

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	19:12146	ORNL/TM–12698
	19:12177	ORNL/FTR–4813
	19:12199	CONF-940538–2
	19:12259	CONF-940402–5
	19:12290	CONF-9311155–
	19:12336	ORNL/M–1572
	19:12345	ORNL/TM–12321
	19:12407	ORNL/CON–318
	19:12429	ORNL/TM–12499
	19:12482	CONF-931234–6
	19:12533	ORNL/M–3198
	19:12563	CONF-930956–2
	19:12564	CONF-931009–20
	19:12565	CONF-931108–70
	19:12566	CONF-9311153–2
	19:12567	CONF-931257–1
	19:12568	CONF-940135–3
	19:12586	ORNL/M–3155
	19:12587	ORNL/Sub–86-SD861/01
	19:12596	CONF-931108–83
	19:12637	CONF-931081–Absts.
	19:12638	CONF-940412–4
	19:12658	ORNL/ER/Sub–87-99053/31
	19:12659	ORNL/FTR–4837
	19:12690	CONF-9304148–2
	19:12711	CONF-9310167–6
	19:12712	CONF-940550–6
	19:12713	CONF-940550–8
	19:12714	CONF-940550–10
	19:12852	CONF-9310290–1
	19:12975	ORNL/FTR–4866
	19:12976	PATENTS-US–A7825225
	19:13022	CONF-940424–19
	19:13023	CONF-940424–16
	19:13057	ORNL/TM–12633
	19:13065	CONF-9307151–1
	19:13102	ORNL/TM–12626
	19:13122	ES/ER/TM–96
	19:13136	CONF-940340–1
	19:13323	CONF-931208–2
	19:13329	CONF-940353–3
	19:13562	CONF-940161–1
	19:13806	PATENTS-US–A7811222
	19:13810	CONF-940424–14
	19:13811	CONF-940424–20
	19:13812	CONF-940424–22
	19:13931	CONF-9309119–4
	19:13932	CONF-9309119–5
	19:14063	ORNL/FTR–4848
	19:14121	DOE/ER–0313/14
	19:14195	ORNL/FTR–4860
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	19:14263	ORNL/TM–12506
	19:14279	ORNL/TM–12651
Oak Ridge Y-12 Plant, TN (United States)		
	19:11869	Y/DZ–1043
Lawrence Berkeley Lab., CA (United States)		
	19:12338	LBL–34144
Lawrence Livermore National Lab., CA (United States)		
	19:12979	UCRL-JC–115217
Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering		
	19:12175	NUREG/CR–4816-Rev.2
	19:12244	NUREG/CR–6076
	19:12532	NUREG/CR–6139
Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)		
	19:11877	K/NSP–165
AC05-84OS21400		**Oak Ridge Y-12 Plant, TN (United States)**
	19:11792	Y/EN–4787
	19:11794	Y/TS–1015
	19:12782	Y/EN–4684
HSW Environmental Consultants, Inc., Oak Ridge, TN (United States)		
	19:11793	Y/SUB–92-YP507C/2/P1
AC05-92OR21972		**Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project**
	19:11846	FEMP–2291
	19:12720	FEMP–2315
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	19:11700	FEMP/SUB–068
AC05-93OR22160		**IIT Research Inst., Chicago, IL (United States)**
	19:13074	DOE/OR/22160–T5
AC06-76RL01830		**Atlantic Richfield Hanford Co., Richland, WA (United States)**
	19:11662	ARH–263-RD
	19:11663	ARH–1943
	19:11796	ARH–2036
	19:11797	ARH-CD–962
	19:11824	ARH–1394
Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab.		
	19:11665	BNWL-C–119
	19:11703	HW–81295-12
	19:12198	BNWL-CC–337-Del.
Douglas United Nuclear, Inc., Richland, WA (United States)		
	19:12200	DUN–1728
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	19:12261	DUN–5538-RD
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	19:11610	HW–27796
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	19:11623	HW–79468
	19:11848	HW–79944
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	19:12191	HW–34821
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	19:12206	HW–3-3046
	19:12207	HW–13292
	19:12208	HW–21404
Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications		
	19:13293	NUREG/CR–5569-Rev.1
General Atomics, San Diego, CA (United States)		
	19:13948	GA-A–21518
	19:13949	GA-A–21520
	19:13950	GA-A–21525
	19:13952	GA-A–21554
Oak Ridge K-25 Site, TN (United States)		
	19:12717	ES/ER/TM–101
Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). Central Safety Evaluation Team		
	19:11873	ES/CSET–19

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	19:12209	HW–21413
	19:12210	HW–21461
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	19:14078	DOE/ER–0313/14
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	19:14085	DOE/ER–0313/14
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	19:14112	DOE/ER–0313/14
	19:14124	DOE/ER–0313/14
	19:14125	DOE/ER–0313/14
	General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation	
	19:11606	HW–32726-RD
	19:11607	HW–50081
	19:11611	HW–31864
	19:11614	HW–35055
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	19:12697	HW–61565-RD
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	19:11735	PNL-SA–23007
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	19:11740	PNL-SA–23686
	19:11810	PNL–9223
	19:11841	DOE/RL–93-38
	19:11842	DOE/RL–93-38-Exec.Summ.
	19:11854	PNL-SA–22008
	19:11855	PNL-SA–22431
	19:11856	PNL-SA–22796
	19:11857	PNL-SA–22797
	19:11858	PNL-SA–23727
	19:11882	PNL-SA–23650
	19:12291	DOE/FTR–94002461
	19:12295	PNL-SA–22929
	19:12329	PNL–8965
	19:12430	PNL–9002
	19:12431	PNL-SA–22193-Vol.1
	19:12432	PNL-SA–22193-Vol.2
	19:12433	PNL-SA–23457
	19:12446	PNL–8834
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	19:12816	PNL-SA–23676
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	19:13232	DOE/FTR–94000733
	19:13304	PNL-SA–21948
	19:13305	PNL-SA–22828
	19:13339	PNL-SA–23042
	19:13340	PNL-SA–23047
	19:14225	PNL-SA–23192
	19:14264	PNL-SA–21969
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications	
	19:11722	NUREG/CR–6114-Vol.1
	USAEC Waste Management Advisory Board, Richland, WA (United States)	
	19:11670	CPD–220-Add.
AC06-87RL10930	**Westinghouse Hanford Co., Richland, WA (United States)**	
	19:11768	WHC-SA–1985
	19:11769	WHC-SD-C018H-PLN–004
	19:11770	WHC-SD-EN-EV–026
	19:11859	WHC-SA–1529
	19:11860	WHC-SA–2254
	19:11861	WHC-SA–2304
	19:11862	WHC-SD-EN-AP–122
	19:11863	WHC-SD-EN-AP–154
	19:11864	WHC-SD-EN-RA–014
	19:11865	WHC-SD-EN-TI–212
	19:11866	WHC-SD-WM-DP–018
	19:12162	WHC-MR–0191
	19:12283	WHC-SA–2121
	19:13111	WHC-EP–0394-7
	19:13112	WHC-SD-EN-TI–219
	19:13113	WHC-SD-EN-TP–039
	19:14229	WHC-SA–2050
	19:14230	WHC-SA–2194
	General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation	
	19:12320	HW–59717

Contract No.	Abstract No.	Report No.
	Pacific Northwest Lab., Richland, WA (United States)	
	19:11855	PNL-SA-22431
	USDOE Richland Operations Office, WA (United States)	
	19:11688	DOE/RL-90-04-Rev.2
	19:11804	DOE/RL-93-0047
	19:11805	DOE/RL-93-56-3
	19:11839	DOE/RL-92-76
AC07-76ID01570	**EG and G Idaho, Inc., Idaho Falls, ID (United States)**	
	19:11551	DOE/ID/01570-T172
	19:11552	DOE/ID/01570-T173
	19:11681	DOE/LLW-193
	19:11843	EGG-WTD-10784-Vol.1
	19:11844	EGG-WTD-10784-Vol.2
	19:11845	EGG-WTD-10784-Vol.3
	19:11922	DOE/ID-10430(AR)
	19:11923	DOE/ID-10430(KS)
	19:11924	DOE/ID-10430(LA)
	19:11925	DOE/ID-10430(MO)
	19:11926	DOE/ID-10430(MT)
	19:11927	DOE/ID-10430(ND)
	19:11928	DOE/ID-10430(OK)
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	19:11930	DOE/ID-10430(TX)
	19:11931	DOE/ID-10430(UT)
	19:11932	DOE/ID-10430(WY)
	19:11940	DOE/ID-10360(V2)
	19:12171	ERA-NRE-94-008
	19:12201	EGG-NPR-10795
	19:12278	PATENTS-US-A7841109
	19:12344	EGG-RAAM-10980
	19:12452	EGG-EP-10948
	19:12453	EGG-EP-10999
	19:12570	EGG-SCM-10713
	19:12600	EGG-SCM-10804
	19:12615	PATENTS-US-A7820462
	19:12716	EGG-WTD-10895
	19:13158	EGG-2700/92
	19:14138	DOE/FTR-94004467
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	19:12274	NUREG/CR-5935
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications	
	19:11723	NUREG/CR-6138
AC07-84ID12435	**Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States)**	
	19:12661	PATENTS-US-A7831017
AC08-87NV10576	**Science Applications International Corp., Las Vegas, NV (United States)**	
	19:11667	CONF-930205-82
AC08-89NV10630	**Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States)**	
	19:13070	DOE/NV/10630-57
	Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Waste Operations Dept.	
	19:11799	DOE/NV/10630-63
AC08-90NV10845	**Nevada Univ., Reno, NV (United States). Desert Research Inst.**	
	19:11800	DOE/NV/10845-37
	19:13037	DOE/NV/10845-27
	Nevada Univ., Reno, NV (United States). Water Resources Center	
	19:11682	DOE/NV/10845-23
	19:13071	DOE/NV/10845-31
AC08-91NV10833	**Raytheon Services Nevada, Las Vegas, NV (United States)**	
	19:11834	DOE/NV/10833-T2
AC08-93NV11265	**EG and G Energy Measurements, Inc., Los Alamos, NM (United States). Los Alamos Operations**	
	19:13001	EGG-11265-5013
	EG and G Energy Measurements, Inc., Las Vegas, NV (United States)	
	19:13076	EGG-11265-2029
AC08-94NV11432	**Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States)**	
	19:11686	DOE/NV/11432-40
	19:13038	DOE/NV/11432-10
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant**	
	19:12540	SR/H-676
	19:12541	SR/H-677
	19:12542	SR/H-678
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Engineering Dept.	
	19:12249	SR/H-674
	19:12250	SR/H-675
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept.	
	19:12178	SR/H-689
	19:12252	SR/H-687
	19:12538	SR/H-671
	Hanford Engineer Works, Richland, WA (United States)	
	19:12248	SR/H-665
	19:12251	SR/H-680
	19:12539	SR/H-672
AC09-89SR18035	**Westinghouse Savannah River Co., Aiken, SC (United States)**	
	19:11771	WSRC-MS-93-231
	19:11772	WSRC-MS-93-317
	19:11773	WSRC-MS-93-380
	19:11774	WSRC-MS-93-405
	19:11775	WSRC-MS-93-482
	19:11776	WSRC-MS-93-491
	19:11777	WSRC-MS-93-550
	19:11778	WSRC-MS-93-582
	19:11779	WSRC-MS-93-606
	19:11780	WSRC-RP-93-997
	19:11781	WSRC-RP-93-1039
	19:11782	WSRC-RP-93-1271-TL
	19:11783	WSRC-RP-93-1318
	19:11784	WSRC-RP-93-1319
	19:11785	WSRC-RP-93-1604
	19:11786	WSRC-TR-92-142-Rev.1
	19:11787	WSRC-TR-93-414
	19:11788	WSRC-TR-93-468
	19:11789	WSRC-TR-93-528
	19:11790	WSRC-TR-93-681
	19:11791	WSRC-TR-93-761
	19:11813	WSRC-MS-93-523
	19:11814	WSRC-RP-94-96
	19:11815	WSRC-TR-94-017
	19:11867	WSRC-MS-93-448
	19:11868	WSRC-TR-93-346-Rev.1
	19:12354	PATENTS-US-A7841169
	19:12552	WSRC-MS-94-080
	19:12553	WSRC-MS-94-081
	19:12554	WSRC-TR-93-595
	19:12592	WSRC-TR-92-557-Rev.1
	19:12618	PATENTS-US-A7841170
	19:12662	PATENTS-US-A7843334
	19:12736	PATENTS-US-A7820463

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	19:12737	PATENTS-US–A7833216
	19:12738	PATENTS-US–A7843027
	19:12739	PATENTS-US–A7844326
	19:12781	WSRC-MS–93-612
	19:12811	PATENTS-US–A7817009
	19:12992	PATENTS-US–A7832567
	19:13060	WSRC-MS–93-586
	19:13114	WSRC-TR–93-496
	19:13115	WSRC-TR–93-526
	19:13116	WSRC-TR–93-563
	19:13117	WSRC-TR–93-568
	19:13118	WSRC-TR–93-569
	19:13119	WSRC-TR–93-574
	19:14274	WSRC-IM–92-109
	19:14275	WSRC-MS–93-576
	19:14280	WSRC-MS–94-029
AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (United States)**	
	19:12735	PATENTS-US–A7819244
AC21-86MC21023	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:11992	DOE/METC–93/6131
	19:11993	DOE/METC–93/6131
	19:12057	DOE/METC–93/6131
	19:12092	DOE/METC–93/6131
AC21-86MC22118	**Radian Corp., Austin, TX (United States)**	
	19:11490	DOE/MC/22118–3546
AC21-86MC23075	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:11999	DOE/METC–93/6131
AC21-86MC23167	**Westinghouse Electric Corp., Orlando, FL (United States)**	
	19:11517	DOE/MC/23167–3636
	Textron, Inc., Everett, MA (United States). Textron Defense Systems	
	19:11516	DOE/MC/23167–3527
AC21-87MC23170	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:11996	DOE/METC–93/6131
	19:12060	DOE/METC–93/6131
AC21-87MC24116	**Coal Technology Corp., Bristol, VA (United States)**	
	19:11423	DOE/MC/24116–94/C0282
	19:11424	DOE/MC/24116–3632
AC21-87MC24257	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12089	DOE/METC–93/6131
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center	
	19:12053	DOE/MC/24257–3687
AC21-88MC24021	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12092	DOE/METC–93/6131
	Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center	
	19:11422	DOE/MC/24021–3544
AC21-88MC25003	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12061	DOE/METC–93/6131
AC21-88MC25006	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12062	DOE/METC–93/6131
AC21-88MC25022	**Allied-Signal Aerospace Co., Torrance, CA (United States). AiResearch Los Angeles Div.**	
	19:12054	DOE/MC/25022–3619
AC21-88MC25034	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12094	DOE/METC–93/6131
AC21-88MC25105	**Geoscience Electronics Corp., Westlake Village, CA (United States)**	
	19:11588	DOE/MC/25105–94/C0302
AC21-88MC25203	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12093	DOE/METC–93/6131
AC21-89MC25177	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12002	DOE/METC–93/6131
AC21-89MC26040	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12082	DOE/METC–93/6131
AC21-89MC26288	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12090	DOE/METC–93/6131
AC21-89MC26366	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12078	DOE/METC–93/6131
AC21-89MC26367	**Manufacturing and Technology Conversion International, Inc., Columbia, MD (United States)**	
	19:11892	DOE/MC/26367–3622
AC21-89MC26372	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12066	DOE/METC–93/6131
AC21-90MC26024	**CER Corp., Las Vegas, NV (United States)**	
	19:11589	DOE/MC/26024–94/C0290
AC21-90MC27224	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12085	DOE/METC–93/6131
AC21-90MC27423	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12088	DOE/METC–93/6131
AC21-91MC27233	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12063	DOE/METC–93/6131
AC21-91MC28130	**Sotia Group, Dallas, TX (United States)**	
	19:11585	DOE/MC/28130–94/C0296
AC21-91MC28240	**Belden and Blake Corp., North Canton, OH (United States)**	
	19:11590	DOE/MC/28240–94/C0301
AC21-92MC28016	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12087	DOE/METC–93/6131
AC21-92MC28053	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12067	DOE/METC–93/6131
AC21-92MC28182	**Smith International, Inc., Houston, TX (United States)**	
	19:12784	DOE/MC/28182–94/C0303
AC21-92MC29011	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:12083	DOE/METC–93/6131
AC21-92MC29245	**USDOE Morgantown Energy Technology Center, WV (United States)**	
	19:11998	DOE/METC–93/6131
AC21-92MC29246	**Minnesota Univ., Minneapolis, MN (United States). Dept. of Civil and Mineral Engineering**	
	19:11429	DOE/MC/29246–3616
	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12086	DOE/METC–93/6131
AC21-92MC29470	**CNG Research Co., Pittsburgh, PA (United States)**	
	19:11592	DOE/MC/29470–3668
AC21-93MC29240	**Bunger (James W.) and Associates, Inc., Salt Lake City, UT (United States)**	
	19:11602	DOE/MC/29240–94/C0280

Contract No.	Abstract No.	Report No.
AC21-93MC30246	Solar Turbines, Inc., San Diego, CA (United States). Product Development Center	
	19:11597	DOE/MC/30246–3617
AC22-88ID12735	MSE, Inc., Butte, MT (United States)	
	19:12351	DOE/ID/12735–T29
AC22-88PC79997	Pennsylvania State Univ., University Park, PA (United States). Coal and Organic Petrology Labs.	
	19:11505	DOE/PC/79997–1
AC22-88PC88801	Auburn Univ., AL (United States). Dept. of Chemical Engineering	
	19:11430	DOE/PC/88801–T5
	19:11431	DOE/PC/88801–T6
	19:11432	DOE/PC/88801–T7
	19:11433	DOE/PC/88801–T8
	19:11434	DOE/PC/88801–T9
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	19:11439	DOE/PC/88801–T14
	19:11440	DOE/PC/88801–T15
AC22-89BC14474	Michigan Univ., Ann Arbor, MI (United States)	
	19:11532	DOE/BC/14474–11
AC22-89BC14479	Colorado Univ., Boulder, CO (United States). Dept. of Chemical Engineering	
	19:11598	DOE/BC/14479–16
AC22-89PC89883	CONSOL, Inc., Library, PA (United States)	
	19:11444	DOE/PC/89883–77
AC22-90BC14652	Oklahoma Univ., Norman, OK (United States)	
	19:11533	DOE/BC/14652–11
	19:11539	DOE/BC/14652–13
	19:11540	DOE/BC/14652–14
AC22-91PC91034	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	19:11445	DOE/PC/91034–T6
AC22-91PC91057	UOP, Inc., Des Plaines, IL (United States)	
	19:11446	DOE/PC/91057–T6
AC22-92BC14831	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering	
	19:11541	DOE/BC/14831–5
	19:11542	DOE/BC/14831–6
AC22-92BC14881	Kansas Univ. Center for Research, Inc., Lawrence, KS (United States)	
	19:11544	DOE/BC/14881–4
AC22-92BC14884	Columbia Univ., New York, NY (United States)	
	19:11545	DOE/BC/14884–3
	19:11546	DOE/BC/14884–4
AC22-92MT92001	Continental Shelf Associates, Inc., Jupiter, FL (United States)	
	19:11576	DOE/MT/92001–1
AC22-92MT92011	Texas Univ., Austin, TX (United States). Bureau of Economic Geology	
	19:11575	DOE/MT/92011–6
AC22-92MT92012	Mission Research Corp., San Diego, CA (United States)	
	19:11582	DOE/MT/92012–5
AC22-92PC91047	Viking Systems International, Inc., Pittsburgh, PA (United States)	
	19:11479	DOE/PC/91047–T6
AC22-92PC92108	Energy International Corp., Pittsburgh, PA (United States)	
	19:11918	DOE/PC/92108–T5
	19:12677	DOE/PC/92108–T4
AC22-92PC92111	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	19:11595	DOE/PC/92111–T4
AC22-92PC92117	Michigan Biotechnology Inst., Lansing, MI (United States)	
	19:11919	DOE/PC/92117–T6
AC22-92PC92119	Geo-Microbial Technologies, Inc., Ochelata, OK (United States)	
	19:11493	DOE/PC/92119–T2
AC22-92PC92159	Combustion Engineering, Inc., Windsor, CT (United States)	
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AC22-92PC92160	Babcock and Wilcox Co., Alliance, OH (United States)	
	19:11515	CONF-9309111–6
	19:12037	CONF-930787–6
AC22-92PC92207	Process Technology, Inc., Calumet, MI (United States)	
	19:11415	DOE/PC/92207–T4-Vol.1
AC22-93BC14860	Surtek, Inc., Golden, CO (United States)	
	19:11543	DOE/BC/14860–3
AC22-93PC92120	Media and Process Technology, Inc., Pittsburgh, PA (United States)	
	19:11450	DOE/PC/92120–T1
AC35-89ER40486	Lawrence Livermore National Lab., CA (United States)	
	19:12979	UCRL-JC–115217
AC79-82BP31302	USDOE Bonneville Power Administration, Portland, OR (United States)	
	19:12396	DOE/BP–1913
AC79-93BP99893	Electronic Power Conditioning, Inc., Corvallis, OR (United States)	
	19:11979	DOE/BP/99893–T1
AI01-91CE50306	Cummins Engine Co., Inc., Columbus, IN (United States)	
	19:12450	DOE/NASA–0373-1
AI01-93EI23956	Geological Survey, Denver, CO (United States)	
	19:11604	DOE/EI/23956–T1
AI08-92NV10874	Geological Survey, Denver, CO (United States)	
	19:11767	USGS-OFR–93-60
AI79-89BP02737	Oregon State Univ., Corvallis, OR (United States). Oregon Cooperative Fishery Research Unit	
	19:11933	DOE/BP/02737–4
AI79-93BP02886	National Fishery Research and Development Lab., Wellsboro, PA (United States)	
	19:13132	DOE/BP/02886–1
AS05-76ER03956	Argonne National Lab., IL (United States)	
	19:12922	ANL-HEP-CP–94-08
AS05-80ER10666	Maryland Univ., College Park, MD (United States). Dept. of Physics	
	19:12834	DOE/ER/10666–10
AT21-93MC30139	Geological Survey, Denver, CO (United States). Petroleum Geology Branch	
	19:11586	DOE/MC/30139–94/C0295
BI79-88BP91819	Eastern Washington Univ., Chaney, WA (United States). Upper Columbia United Tribes Fisheries Research Center	
	19:13133	DOE/BP–91819-5
BI79-89BP98636	Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR (United States). Dept. of Natural Resources	
	19:11939	DOE/BP/98636–1
BI79-91BP21182	Idaho Dept. of Fish and Game, Boise, ID (United States). Fisheries Research Section	
	19:11934	DOE/BP/21182–1
	19:11935	DOE/BP/21182–2

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BI79-92BP64458	Washington Dept. of Fisheries, Olympia, WA (United States)	
	19:13194	DOE/BP/64458–1
BI79-92BP90299	Oregon Dept. of Fish and Wildlife, Portland, OR (United States)	
	19:11938	DOE/BP/90299–1
FC07-85ID10412	Texas Univ., Austin, TX (United States). Bureau of Economic Geology	
	19:11536	DOE/ID/10412–8
	19:11553	DOE/ID/10412–6
	Texas Univ., Austin, TX (United States). Dept. of Petroleum Engineering	
	19:11587	DOE/ID/10412–7
FC07-89ID12847	American Iron and Steel Inst., Pittsburgh, PA (United States)	
	19:12487	DOE/ID/12847–6
FC08-90NV10872	Nevada Univ., Las Vegas, NV (United States)	
	19:11685	DOE/NV/10872–T98
	Nevada Univ., Las Vegas, NV (United States). Harry Reid Center for Environmental Studies	
	19:11684	DOE/NV/10872–T91
	19:13072	DOE/NV/10872–T92
	19:13073	DOE/NV/10872–T93
	Nevada Univ., Las Vegas, NV (United States). Dept. of Civil and Environmental Engineering	
	19:11683	DOE/NV/10872–T85
FC09-88SR15199	South Carolina Univ., Columbia, SC (United States). Savannah River Archaeological Research Program	
	19:12299	DOE/SR/15199–6
FC21-86MC10637	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12068	DOE/METC–93/6131
	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	19:11502	DOE/MC/10637–3618
FC21-86MC11076	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12000	DOE/METC–93/6131
	University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst.	
	19:12415	DOE/MC/11076–3620
FC21-87MC24132	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:11989	DOE/METC–93/6131
	American Electric Power Service Corp., Columbus, OH (United States)	
	19:11491	DOE/MC/24132–3635
	19:11518	DOE/MC/24132–3633
FC21-89MC26042	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12057	DOE/METC–93/6131
	19:12091	DOE/METC–93/6131
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FC21-90MC25140	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:11994	DOE/METC–93/6131
	19:12058	DOE/METC–93/6131
	19:12080	DOE/METC–93/6131
FC21-90MC27286	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	19:11599	DOE/MC/27286–94/C0281
FC21-91MC26308	Combustion Engineering, Inc., Windsor, CT (United States)	
	19:11425	DOE/MC/26308–3637
	19:11427	DOE/MC/26308–3640
	19:11513	DOE/MC/26308–3647
	19:11982	DOE/MC/26308–3628
	19:11983	DOE/MC/26308–3645
	19:11984	DOE/MC/26308–3648
	ABB/Combustion Engineering, Inc., Windsor, CT (United States)	
	19:11426	DOE/MC/26308–3639
FC21-91MC27363	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:11987	DOE/METC–93/6131
FC21-91MC28050	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12059	DOE/METC–93/6131
	Dravo Lime Co., Pittsburgh, PA (United States)	
	19:12416	DOE/MC/28060–94/C0276
FC21-92MC27391	Kerr-McGee Coal Corp., Oklahoma City, OK (United States)	
	19:11428	DOE/MC/27391–94/C0283
FC21-92MC29077	Oklahoma Univ., Norman, OK (United States). School of Petroleum and Geological Engineering	
	19:11591	DOE/MC/29077–94/C0288
FC21-92MC29237	Fuel Cell Engineering Corp., Danbury, CT (United States)	
	19:12355	DOE/MC/29237–3512
FC21-93MC29444	Tampella Power Corp., Williamsport, PA (United States)	
	19:11985	DOE/MC/29444–3651
FC21-93MC30070	CER Corp., Las Vegas, NV (United States)	
	19:11593	DOE/MC/30070–94/C0289
FC21-93MC30097	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	19:11413	DOE/MC/30097–3626
	19:11986	DOE/MC/30097–3627
FC21-93MC30126	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12070	DOE/METC–93/6131
FC22-83FE60149	National Inst. for Petroleum and Energy Research, Bartlesville, OK (United States)	
	19:11561	NIPER–658
FC22-91PC90545	Babcock and Wilcox Co., Alliance, OH (United States)	
	19:12033	DOE/PC/90545–T10
FC22-92PC92162	Consortium for Coal-Water Slurry Fuel Technology, University Park, PA (United States)	
	19:11521	DOE/PC/92162–T3
FC22-92PC92521	Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States)	
	19:11416	DOE/PC/92521–T92
	19:11451	DOE/PC/92521–T78
	19:11452	DOE/PC/92521–T81
	19:11453	DOE/PC/92521–T82
	19:11454	DOE/PC/92521–T83
	19:11455	DOE/PC/92521–T84
	19:11456	DOE/PC/92521–T86
	19:11457	DOE/PC/92521–T89
	19:11458	DOE/PC/92521–T90
	19:11459	DOE/PC/92521–T93
	19:11460	DOE/PC/92521–T118
	19:11461	DOE/PC/92521–T119
	19:11466	DOE/PC/92521–T71
	19:11467	DOE/PC/92521–T76
	19:11468	DOE/PC/92521–T85
	19:11469	DOE/PC/92521–T87
	19:11470	DOE/PC/92521–T88
	19:11471	DOE/PC/92521–T96
	19:11483	DOE/PC/92521–T67
	19:11484	DOE/PC/92521–T68

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	19:11485	DOE/PC/92521–T79
	19:11486	DOE/PC/92521–T80
	19:11487	DOE/PC/92521–T91
	19:11494	DOE/PC/92521–T74
	19:11495	DOE/PC/92521–T75
	19:11496	DOE/PC/92521–T77
	19:11497	DOE/PC/92521–T94
	19:11498	DOE/PC/92521–T95
	19:11499	DOE/PC/92521–T97
	19:11500	DOE/PC/92521–T98
	19:11522	DOE/PC/92521–T69
	19:11523	DOE/PC/92521–T70
	19:11524	DOE/PC/92521–T72
	19:11525	DOE/PC/92521–T73
	Southern Illinois Univ., Carbondale, IL (United States). Dept. of Mechanical Engineering and Energy Processes	
	19:11462	DOE/PC/92521–T120
FC22-93BC14951	Tulsa Univ., OK (United States)	
	19:11548	DOE/BC/14951–3
FC22-93BC14955	American Oil Recovery, Inc., Decatur, IL (United States)	
	19:11549	DOE/BC/14955–2
	19:11550	DOE/BC/14955–3
FG01-91CE26615	Lansing Board of Water and Light, MI (United States)	
	19:12441	DOE/CE/26615–T1
FG01-92EW50625	Medical Univ. of South Carolina, Charleston, SC (United States)	
	19:13069	DOE/EW/50625–T14
FG01-93CE15558	Gilfillian Engineering and Environmental Testing, Inc., Anchorage, AK (United States)	
	19:13068	DOE/CE/15558–T1
FG01-93MI10270	Southeastern Consortium for Minorities in Engineering, Atlanta, GA (United States)	
	19:12298	DOE/MI/10270–T1
FG02-85ER13442	Michigan Univ., Ann Arbor, MI (United States)	
	19:13862	DOE/ER/13442–8
FG02-85ER53207	Colorado Univ., Boulder, CO (United States). Dept. of Astrophysical, Planetary, and Atmospheric Sciences	
	19:14132	DOE/ER/53207–10
FG02-86ER13480	Princeton Univ., NJ (United States). Dept. of Chemistry	
	19:12705	DOE/ER/13480–4
FG02-86ER13590	State Univ. of New York, Stony Brook, NY (United States)	
	19:13838	DOE/ER/13590–13
FG02-86ER45247	Argonne National Lab., IL (United States)	
	19:13916	ANL/MSD/PP–73288
FG02-86ER60407	Memorial Sloan-Kettering Cancer Center, New York, NY (United States)	
	19:13155	DOE/ER/60407–T2
FG02-86ER60417	Wisconsin Univ., Madison, WI (United States). Dept. of Medical Physics	
	19:13228	DOE/ER/60417–8
FG02-87ER13714	Princeton Univ., NJ (United States). Dept. of Chemical Engineering	
	19:13879	DOE/ER/13714–T2
FG02-87ER13774	Pittsburgh Univ., PA (United States)	
	19:12673	DOE/ER/13774–4
FG02-87ER40371	Brookhaven National Lab., Upton, NY (United States)	
	19:13479	BNL–52389
FG02-87ER60507	Wisconsin Univ., Madison, WI (United States). Dept. of Human Oncology	
	19:13229	DOE/ER/60507–7
FG02-87ER60522	Princeton Univ., NJ (United States). Joseph Henry Labs.	
	19:12935	DOE/ER/60522–7
FG02-87ER60524	Michigan State Univ., East Lansing, MI (United States). Carcinogenesis Lab.	
	19:13230	DOE/ER/60524–7
FG02-87ER60533	Michigan Univ., Ann Arbor, MI (United States)	
	19:13151	DOE/ER/60533–6
FG02-88ER40417	Brookhaven National Lab., Upton, NY (United States)	
	19:13665	BNL–49960
FG02-88ER45372	Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy	
	19:13882	DOE/ER/45372–6
FG02-88ER60621	Rochester Univ., NY (United States)	
	19:13141	DOE/ER/60621–T1
FG02-90ER14114	Rensselaer Polytechnic Inst., Troy, NY (United States). Dept. of Chemical Engineering	
	19:13139	DOE/ER/14114–3
FG02-90ER14162	Columbia Univ., New York, NY (United States). Dept. of Chemistry	
	19:13911	DOE/ER/14162–3
FG02-90ER60985	Northeastern Univ., Boston, MA (United States). Barnett Inst. of Chemical Analysis and Materials Science	
	19:13142	DOE/ER/60985–3
FG02-90ER80896	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12095	DOE/METC–93/6131
FG02-91CE23810	Akron Univ., OH (United States)	
	19:12597	DOE/CE/23810–14
	Imagination Resources, Inc., Dublin, OH (United States)	
	19:12598	DOE/CE/23810–33C
FG02-91ER20037	Cornell Univ., Ithaca, NY (United States)	
	19:13195	DOE/ER/20037–1
FG02-91ER40606	Chicago Univ., IL (United States). Dept. of Astronomy and Astrophysics	
	19:13396	DOE/ER/40606–3
FG02-91ER40608	Argonne National Lab., IL (United States)	
	19:13518	ANL/PHY/PP–73096
FG02-91ER40631	Fermi National Accelerator Lab., Batavia, IL (United States)	
	19:13593	FNAL/C–93/403-E
FG02-91ER40664	Fermi National Accelerator Lab., Batavia, IL (United States)	
	19:13593	FNAL/C–93/403-E
FG02-91ER40682	Fermi National Accelerator Lab., Batavia, IL (United States)	
	19:13593	FNAL/C–93/403-E
FG02-91ER54109	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	19:13938	DOE/FTR–94004455
FG02-91ER61127	Arizona State Univ., Tempe, AZ (United States). Dept. of Chemistry and Biochemistry	
	19:13143	DOE/ER/61127–3
FG02-91ER75666	South Carolina Univ., Columbia, SC (United States)	
	19:12313	DOE/ER/75666–1
FG02-92ER61490	Eleanor Roosevelt Inst., Denver, CO (United States)	
	19:13145	DOE/ER/61490–1
FG02-92ER61497	Children's Hospital of Philadelphia, PA (United States)	
	19:13150	DOE/ER/61497–1

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FG02-92ER75711	Texas Univ., Austin, TX (United States). Nuclear Engineering Teaching Lab.	
	19:13813	DOE/ER/75711–1
FG02-92ER81364	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12069	DOE/METC–93/6131
FG03-85ER45197	California Univ., Santa Barbara, CA (United States). Dept. of Physics	
	19:13881	DOE/ER/45197–8
FG03-85SF15798	Hawaii Univ., Honolulu, HI (United States)	
	19:11960	DOE/SF/15798–T5
	19:11961	DOE/SF/15798–T8
	19:11965	DOE/SF/15798–T7
	19:11966	DOE/SF/15798–T9
	Leilani Foliage, Pahoa, HI (United States)	
	19:11967	DOE/SF/15798–T10
	Oceanit Labs., Inc., Honolulu, HI (United States)	
	19:11962	DOE/SF/15798–T11
	Papaya Products of Hawaii, Keaau, HI (United States)	
	19:11964	DOE/SF/15798–T6
	D'Anna B'Nana, Pahoa, HI (United States)	
	19:11968	DOE/SF/15798–T12
FG03-86ER53225	General Atomics, San Diego, CA (United States)	
	19:13949	GA-A–21520
	19:13952	GA-A–21554
FG03-88ER60660	California Univ., San Diego, La Jolla, CA (United States). Dept. of Radiology	
	19:13231	DOE/ER/60660–T1
FG03-89ER14053	University of Southern California, Los Angeles, CA (United States). Dept. of Chemistry	
	19:12706	DOE/ER/14053–T4
FG03-89ER51121	General Atomics, San Diego, CA (United States)	
	19:13949	GA-A–21520
	19:13951	GA-A–21541
FG03-90ER80998	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:12084	DOE/METC–93/6131
FG03-91ER20039	Research Inst. of Scripps Clinic, La Jolla, CA (United States). Dept. of Cell Biology	
	19:13140	DOE/ER/20039–T1
FG03-91ER54115	Oak Ridge National Lab., TN (United States)	
	19:14089	DOE/ER–0313/14
	19:14131	DOE/ER–0313/14
FG03-91ER81229	USDOE Morgantown Energy Technology Center, WV (United States)	
	19:11997	DOE/METC–93/6131
FG03-91SF18862	Syracuse Univ., NY (United States). Dept. of Physics	
	19:14139	DOE/SF/18862–T2
FG03-92ER14304	Stanford Univ., CA (United States). Dept. of Chemistry	
	19:12599	DOE/ER/14304–1
FG03-92ER40711	San Francisco State Univ., CA (United States). Dept. of Physics and Astronomy	
	19:13489	DOE/ER/40711–T1
FG03-92ER54137	TSI Research, Inc., Solana Beach, CA (United States)	
	19:14134	DOE/ER/54137–T1
FG03-93ER14315	Utah Univ., Salt Lake City, UT (United States)	
	19:12641	DOE/ER/14315–T1
FG03-93ER14317	Stanford Univ., CA (United States)	
	19:12777	DOE/ER/14317–T1
FG03-93ER14333	Utah Univ., Salt Lake City, UT (United States). Dept. of Chemistry	
	19:12674	DOE/ER/14333–1
FG03-93ER14340	Utah Univ., Salt Lake City, UT (United States)	
	19:12675	DOE/ER/14340–1
FG03-93ER40757	Texas Univ., Austin, TX (United States). Dept. of Physics	
	19:13352	DOE/ER/40757–020
	Texas Univ., Austin, TX (United States). Center for Particle Physics	
	19:13490	DOE/ER/40757–322
FG03-93ER45482	Utah Univ., Salt Lake City, UT (United States)	
	19:12569	DOE/ER/45482–1
FG03-93SF19645	Auburn Univ., AL (United States)	
	19:12489	DOE/SF/19645–T3
FG05-80ET53088	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	19:12787	DOE/ET/53088–635
	19:12835	DOE/ET/53088–636
	19:13934	DOE/ET/53088–631
	19:13935	DOE/ET/53088–634
	19:13936	DOE/ET/53088–637
	19:13937	DOE/ET/53088–639
	19:14135	DOE/ET/53088–628
	19:14136	DOE/ET/53088–646
FG05-85ER40200	Texas Univ., Austin, TX (United States). Center for Particle Physics	
	19:13490	DOE/ER/40757–322
FG05-86ER13496	Oklahoma State Univ., Stillwater, OK (United States)	
	19:13137	DOE/ER/13496–T1
FG05-86ER45259	Argonne National Lab., IL (United States)	
	19:12593	ANL/CHM/PP–74824
FG05-86ER60434	Tennessee Univ., Knoxville, TN (United States). Dept. of Chemistry	
	19:13156	DOE/ER/60434–8
FG05-88ER13832	Texas Tech Univ., Lubbock, TX (United States)	
	19:12640	DOE/ER/13832–36
FG05-89ER14003	Oklahoma Univ., Norman, OK (United States). Dept. of Botany and Microbiology	
	19:11898	DOE/ER/14003–3
FG05-89ER45384	Brookhaven National Lab., Upton, NY (United States)	
	19:12293	BNL–60038
FG05-91ER61221	Applied Research Corp., College Station, TX (United States)	
	19:13035	DOE/ER/61221–2
FG05-91OR21981	ChemRisk, Alameda, CA (United States)	
	19:11801	DOE/OR/21981–T3-Vol.2-Pt.A
	19:11802	DOE/OR/21981–T3-Vol.2-Pt.D
	19:11837	DOE/OR/21981–T3-Vol.2-Pt.B
	19:11838	DOE/OR/21981–T3-Vol.2-Pt.C
	Oak Ridge Health Agreement Steering Panel, TN (United States)	
	19:11835	DOE/OR/21981–T2
	Tennessee Dept. of Health, Nashville, TN (United States). Div. of Environmental Epidemiology	
	19:11836	DOE/OR/21981–T3-Vol.1
FG05-92ER14310	New Orleans Univ., LA (United States)	
	19:13837	CONF-9306113–2
FG05-92ER25145	Duke Univ., Durham, NC (United States). Dept. of Mathematics	
	19:12778	DOE/ER/25145–T1

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FG05-92ER40736	Texas Univ., Richardson, TX (United States). Dept. of Physics	
	19:13586	DOE/ER/40736–1
FG05-93ER61610	University of Tennessee Medical Center, Knoxville, TN (United States). Dept. of Radiology	
	19:13157	DOE/ER/61610–1
FG06-86ER13567	Washington State Univ., Pullman, WA (United States)	
	19:12760	DOE/ER/13567–T2
FG06-87ER45287	Washington State Univ., Pullman, WA (United States). Dept. of Mechanical and Materials Engineering	
	19:12483	DOE/ER/45287–1
	19:12484	DOE/ER/45287–2
	19:12485	DOE/ER/45287–3
	19:12486	DOE/ER/45287–6
FG06-87ER53243	Washington Univ., Seattle, WA (United States). Aerospace and Energetics Research Program	
	19:14133	DOE/ER/53243–5
FG06-88ER13869	Washington State Univ., Pullman, WA (United States)	
	19:13138	DOE/ER/13869–5
FG06-90ER40561	Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory	
	19:13663	DOE/ER/40561–118
	19:13672	DOE/ER/40561–121
	19:13880	DOE/ER/40561–114
FG06-90ER45415	Washington Univ., Seattle, WA (United States)	
	19:13830	DOE/ER/45415–T1
FG06-91ER20022	Washington State Univ., Pullman, WA (United States)	
	19:11899	DOE/ER/20022–T1
FG06-92EH89181	Washington State Univ., Richland, WA (United States). Coll. of Pharmacy	
	19:13316	USTUR–0004-93-Vol.2
FG06-92ER14236	Oregon Univ., Eugene, OR (United States). Dept. of Chemistry	
	19:13834	DOE/ER/14236–2
FG06-92ER61487	Washington Univ., Seattle, WA (United States)	
	19:13144	DOE/ER/61487–2
FG06-93ER61552	Envair, Kennewick, WA (United States)	
	19:13036	DOE/ER/61552–1
FG07-90ID12934	Stanford Univ., CA (United States). Stanford Geothermal Program	
	19:11957	DOE/ID/12934–18
FG07-90ID13040	Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center	
	19:11955	DOE/ID/13040–22
FG21-90MC27225	Arkansas Univ., Fayetteville, AR (United States)	
	19:11915	DOE/MC/27225–3625
	19:11916	DOE/MC/27225–3656
FG21-90MC27348	West Virginia Univ., Morgantown, WV (United States)	
	19:11554	DOE/MC/27348–3631
FG21-92MC29228	Lehigh Univ., Bethlehem, PA (United States). Dept. of Chemistry	
	19:11917	DOE/MC/29228–3670
FG22-89PC89783	Oregon State Univ., Corvallis, OR (United States)	
	19:11441	DOE/PC/89783–T9
	19:11442	DOE/PC/89783–T10
	19:11443	DOE/PC/89783–T11
FG22-91PC91281	Auburn Univ., AL (United States). Dept. of Chemical Engineering	
	19:11447	DOE/PC/91281–T8
FG22-91PC91290	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	19:11414	DOE/PC/91290–T8
FG22-91PC91295	Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering	
	19:11492	DOE/PC/91295–T8
FG22-91PC91296	New Mexico Univ., Albuquerque, NM (United States)	
	19:11480	DOE/PC/91296–9
FG22-91PC91297	Clarkson Univ., Potsdam, NY (United States). Dept. of Mechanical and Aeronautical Engineering	
	19:11514	DOE/PC/91297–T4
FG22-91PC91299	State Univ. of New York, Binghamton, NY (United States). Dept. of Chemistry	
	19:11481	DOE/PC/91299–13
FG22-91PC91303	Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering	
	19:11482	DOE/PC/91303–T9
	19:12676	DOE/PC/91303–T8
FG22-91PC91308	Brigham Young Univ., Provo, UT (United States)	
	19:11519	DOE/PC/91308–9
FG22-91PC91311	Auburn Univ., AL (United States). Dept. of Chemical Engineering	
	19:11448	DOE/PC/91311–T9
FG22-91PC91334	Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States)	
	19:11449	DOE/PC/91334–T145
FG22-92PC92530	Iowa State Univ. of Science and Technology, Ames, IA (United States)	
	19:11526	DOE/PC/92530–T5
FG22-92PC92534	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	19:12100	DOE/PC/92534–6
FG22-92PC92535	Northeastern Univ., Boston, MA (United States)	
	19:12101	DOE/PC/92535–T5
FG22-92PC92536	Michigan Univ., Ann Arbor, MI (United States). Dept. of Chemical Engineering	
	19:12678	DOE/PC/92536–T4
FG22-92PC92539	Tulsa Univ., OK (United States). Dept. of Chemical Engineering	
	19:12707	DOE/PC/92539–5
FG22-92PC92542	Lehigh Univ., Bethlehem, PA (United States). Energy Research Center	
	19:12488	DOE/PC/92542–T4
FG22-92PC92544	Brown Univ., Providence, RI (United States). Div. of Engineering	
	19:11488	DOE/PC/92544–6
FG22-92PC92546	Utah Univ., Salt Lake City, UT (United States)	
	19:11489	DOE/PC/92546–T5
FG22-92PC92548	Washington Univ., Seattle, WA (United States). Dept. of Mechanical Engineering	
	19:12102	DOE/PC/92548–T5
FG22-93BC14899	University of Southern California, Los Angeles, CA (United States)	
	19:11547	DOE/BC/14899–9
FG22-93BC14966	ParaMagnetic Logging, Inc., Woodinville, WA (United States)	
	19:11534	DOE/BC/14966–2
FG22-93MT93007	Morgan State Univ., Baltimore, MD (United States)	
	19:11555	DOE/MT/93007–T1
FG22-93PC93203	Arkansas Univ., Little Rock, AR (United States)	
	19:11417	DOE/PC/93203–T1

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FG22-93PC93214	**Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering**	
	19:12103	DOE/PC/93214–T1
W-31-109-ENG-38	**Brookhaven National Lab., Upton, NY (United States)**	
	19:13530	BNL–52389
	19:13733	BNL–52389
W-31109-ENG-38	**Argonne National Lab., Idaho Falls, ID (United States)**	
	19:11627	ANL/FC/CP–79712
	19:14234	ANL/IFR/CP–80791
	Argonne National Lab., IL (United States)	
	19:11419	ANL/CHM/CP–81245
	19:11472	ANL/CHM/CP–81164
	19:11473	ANL/CHM/CP–81165
	19:11474	ANL/CHM/CP–81225
	19:11475	ANL/CHM/CP–81246
	19:11476	ANL/CHM/CP–81657
	19:11477	ANL/CHM/PP–72140
	19:11559	ANL/ESD–19
	19:11625	ANL/CMT/CP–80021
	19:11626	ANL/CMT/CP–81050
	19:11632	ANL/EA/CP–80824
	19:11633	ANL/EA/CP–80976
	19:11657	ANL/CHM/PP–75639
	19:11658	ANL/CMT/PP–71628
	19:11659	ANL/EA/CP–80825
	19:11660	ANL/EA/CP–80957
	19:11661	ANL/EA/CP–80958
	19:11795	ANL/CMT/CP–80861
	19:11816	ANL/CMT/CP–80853
	19:11817	ANL/CMT/CP–80854
	19:11818	ANL/DIS/CP–80823
	19:11819	ANL/DIS/CP–80940
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80956	19:11820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006825	MF-902
80957	19:11660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006536	MF-902; MF-940
80958	19:11661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006828	MF-902
80969	19:11821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006815	MF-902
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80976	19:11633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007696	MF-902
80977	19:11823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007655	MF-902
81915	19:12845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007643	MF-414
81981	19:11574	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006822	MF-902
ANL/EAD/TM–					
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75667	19:14232	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008489	MF-905
77719	19:12297	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008116	MF-902
ANL/ECT/CP–					
82125	19:14233	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007701	MF-405
ANL/EP/CP–					
81423	19:12196	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004611	MF-940
81431	19:12466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004604	
ANL/ER/CP–					
80451	19:13328	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006839	MF-406
ANL/ER/RP–					
81524	19:13063	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005395	
ANL/ES/CP–					
82064	19:12410	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006832	MF-335
82079	19:13031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007647	MF-335
ANL/ES/RP–					
82004	19:13913	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007657	MF-364

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ANL/ESD–					
19	19:11559	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008621	MF-930
ANL/ESD/TM–					
59	19:13064	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008041	
ANL/ET/CP–					
80141	19:12126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006542	
ANL/ET/RP–					
81971	19:13032	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006821	MF-101
ANL/FC/CP–					
79262	19:12253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007913	MF-542
79712	19:11627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005387	MF-530
ANL/FPP/TM–					
263	19:14070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008315	PC-420
ANL/IFR/CP–					
80791	19:14234	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007634	MF-405
ANL/IPD/CP–					
81274	19:14235	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004696	MF-405
ANL/MCS/CP–					
81883	19:14236	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006810	MF-405
81897	19:14237	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006539	MF-405
ANL/MCS/PP–					
73012	19:14238	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008128	MF-405
75914	19:14239	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008127	MF-405
76764	19:14240	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008125	MF-405
ANL/MCT/PP–					
71579	19:12555	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008138	MF-504
71813	19:12556	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008122	MF-364
72080	19:12557	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008121	MF-364
72124	19:12558	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008132	MF-364
72890	19:12595	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008129	MF-504
76194	19:12151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008473	MF-530
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78618	19:12479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007697	MF-404
82054	19:13914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007694	MF-404
82165	19:13915	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007686	MF-404
82175	19:12559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007684	MF-404
ANL/MSD/PP–					
71503	19:12667	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008123	MF-404
71896	19:12560	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008126	MF-404
71900	19:13877	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008118	MF-404
73288	19:13916	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008124	MF-404
74972	19:13878	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007672	MF-404
77692	19:12561	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008135	MF-404
ANL/PHY/CP–					
81852	19:13867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006834	MF-411
81870	19:13344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006538	MF-411
ANL/PHY/PP–					
71811	19:13517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008117	MF-413
73096	19:13518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008108	MF-413
74767	19:13664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008130	MF-413
ANL/RA/CP–					
80543	19:12152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007626	MF-538
81715	19:12179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007633	MF-413
81724	19:12169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007635	MF-505
81815	19:12170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007642	MF-505; MF-520
ANL/RE/CP–					
81947	19:12254	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006826	
ANL/RE/PP–					
73076	19:12480	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008486	MF-506
ANL/RERTR/TM–					
18	19:12197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006497	PC-940
ANL/XFD/PP–					
76784	19:13809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008469	MF-411
ARH–					
1394	19:11824	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007816	MF-603
1943	19:11663	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007817	MF-500
2036	19:11796	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007818	MF-502
263-RD	19:11662	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007813	MF-603
ARH-CD–					
962	19:11797	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007819	MF-502

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BARC–					
1993/E/012	19:12147	OSTI; NTIS (US Sales Only); INIS		DE94616341	
1993/E/013	19:12694	OSTI; NTIS (US Sales Only); INIS		DE94615378	
1993/E/015	19:12775	OSTI; NTIS (US Sales Only); INIS		DE94616241	
1993/E/016	19:12710	OSTI; NTIS (US Sales Only); INIS		DE94616106	
1993/E/017	19:12562	OSTI; NTIS (US Sales Only); INIS		DE94615584	
1993/E/019	19:12776	OSTI; NTIS (US Sales Only); INIS		DE94616242	
1993/E/020	19:12989	OSTI; NTIS (US Sales Only); INIS		DE94616508	
1993/E/023	19:12182	OSTI; NTIS (US Sales Only); INIS		DE94616271	
1993/P/004	19:13929	OSTI; NTIS (US Sales Only); INIS		DE94617113	
1993/P/005	19:12668	OSTI; NTIS (US Sales Only); INIS		DE94615301	
1993/P/006	19:13701	OSTI; NTIS (US Sales Only); INIS		DE94616988	
BF-R–					
40056-01	19:12255	OSTI; NTIS (US Sales Only); INIS		DE94747572	
40056-02	19:12256	OSTI; NTIS (US Sales Only); INIS		DE94747574	
40056-03	19:12257	OSTI; NTIS (US Sales Only); INIS		DE94747573	
BNL–					
43228-Vol.5	19:13227	*See* DOE/EH–0364T			
49654	19:12831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007979	MF-414
49736	19:11825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008091	MF-940
49738	19:11664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008092	MF-721
49779	19:13226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007520	MF-507
49816	19:12925	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007523	MF-414
49875	19:13720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007173	MF-414
49921	19:13519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007179	MF-414
49938	19:13721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007162	MF-414
49946	19:13375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007167	MF-410
49960	19:13665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007177	MF-413
49968	19:13722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007178	MF-414
49969	19:13723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007174	MF-414
49978	19:11871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007175	MF-500
60012	19:12669	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006572	MF-401
60013	19:12670	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006571	MF-401
60038	19:12293	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007977	MF-404
60040	19:13750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007976	MF-414
60090	19:12833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007169	MF-414
60099	19:12481	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007980	MF-404
70395	19:12928	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008663	MF-414
BNL-NUREG–					
49018	19:12258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005191	
52309	19:12273	*See* NUREG/CR–5812			
52359	19:12176	*See* NUREG/CR–5990			
52406	19:12275	*See* NUREG/CR–6169			
BNWL-C–					
119	19:11665	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007823	MF-510
BNWL-CC–					
337-Del.	19:12198	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006963	MF-510
BONN-HE–					
93-05	19:13429	OSTI; NTIS (US Sales Only); INIS		DE94747628	
93-14	19:13430	OSTI; NTIS (US Sales Only); INIS		DE94752364	
93-28	19:13345	OSTI; NTIS (US Sales Only); INIS		DE94752370	
BONN-IR–					
93-58	19:13555	OSTI; NTIS (US Sales Only); INIS		DE94747252	
93-63	19:13751	OSTI; NTIS (US Sales Only); INIS		DE94747249	
93-68	19:13346	OSTI; NTIS (US Sales Only); INIS		DE94747251	
93-73	19:12929	OSTI; NTIS (US Sales Only); INIS		DE94747250	
BUDKERINP–					
91-119	19:12910	OSTI; NTIS (US Sales Only); INIS		DE94618116	
92-11	19:13480	OSTI; NTIS (US Sales Only); INIS		DE94618511	
92-20	19:12911	OSTI; NTIS (US Sales Only); INIS		DE94618117	
92-35	19:12850	OSTI; NTIS (US Sales Only); INIS		DE94618108	
92-46	19:13556	OSTI; NTIS (US Sales Only); INIS		DE94618534	
92-55	19:13557	OSTI; NTIS (US Sales Only); INIS		DE94616869	
92-80	19:13558	OSTI; NTIS (US Sales Only); INIS		DE94618548	
92-83	19:13431	OSTI; NTIS (US Sales Only); INIS		DE94618457	
92-88	19:13376	OSTI; NTIS (US Sales Only); INIS		DE94618410	
92-89	19:13481	OSTI; NTIS (US Sales Only); INIS		DE94618501	
92-97	19:13482	OSTI; NTIS (US Sales Only); INIS		DE94618512	
93-4	19:13644	OSTI; NTIS (US Sales Only); INIS		DE94618569	
93-10	19:13930	OSTI; NTIS (US Sales Only); INIS		DE94617129	

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BIS-ST–					
3/92	19:13225	OSTI; NTIS (US Sales Only); INIS		DE94752427	
4/93	19:12924	OSTI; NTIS (US Sales Only); INIS		DE94752450	
CDM/LSO/DSO–					
57	19:12671	OSTI; NTIS (US Sales Only); INIS		DE94617432	
CDS-MR–					
19.	19:11679	*See* DOE-HMIP-RR–93.033			
CEA-CONF–					
10695	19:13483	OSTI; NTIS (US Sales Only); INIS		DE94618513	
11423	19:11628	OSTI; NTIS (US Sales Only); INIS		DE94617497	
11434	19:13752	OSTI; NTIS (US Sales Only); INIS		DE94618675	
11435	19:13432	OSTI; NTIS (US Sales Only); INIS		DE94618458	
11436	19:13433	OSTI; NTIS (US Sales Only); INIS		DE94618459	
11437	19:13434	OSTI; NTIS (US Sales Only); INIS		DE94618460	
11438	19:13347	OSTI; NTIS (US Sales Only); INIS		DE94618357	
11440	19:13435	OSTI; NTIS (US Sales Only); INIS		DE94618462	
11441	19:12851	OSTI; NTIS (US Sales Only); INIS		DE94618109	
11442	19:13390	OSTI; NTIS (US Sales Only); INIS		DE94618432	
11443	19:13670	OSTI; NTIS (US Sales Only); INIS		DE94618588	
11444	19:13892	OSTI; NTIS (US Sales Only); INIS		DE94618824	
11445	19:13436	OSTI; NTIS (US Sales Only); INIS		DE94618484	
11447	19:13753	OSTI; NTIS (US Sales Only); INIS		DE94618655	
11448	19:13902	OSTI; NTIS (US Sales Only); INIS		DE94618847	
11449	19:13671	OSTI; NTIS (US Sales Only); INIS		DE94618585	
11450	19:13391	OSTI; NTIS (US Sales Only); INIS		DE94618433	
11451	19:13861	OSTI; NTIS (US Sales Only); INIS		DE94618746	
11463	19:12759	OSTI; NTIS (US Sales Only); INIS		DE94613604	
11643	19:13120	OSTI; NTIS (US Sales Only); INIS		DE94617788	
11678	19:11629	OSTI; NTIS (US Sales Only); INIS		DE94617498	
11686	19:11666	OSTI; NTIS (US Sales Only); INIS		DE94618244	
11687	19:12635	OSTI; NTIS (US Sales Only); INIS		DE94617429	
11689	19:12930	OSTI; NTIS (US Sales Only); INIS		DE94618189	
CEA-DPhN–					
91-56	19:13754	OSTI; NTIS (US Sales Only); INIS		DE94618708	
CEA-DSM-T–					
93-19	19:13755	OSTI; NTIS (US Sales Only); INIS		DE94618684	
CEA-LLB–					
91-83	19:13392	OSTI; NTIS (US Sales Only); INIS		DE94618434	
CEA-LNS-Ph–					
91-32	19:13559	OSTI; NTIS (US Sales Only); INIS		DE94618539	
91-33	19:13560	OSTI; NTIS (US Sales Only); INIS		DE94618540	
91-35	19:13561	OSTI; NTIS (US Sales Only); INIS		DE94618541	
CEA-N–					
2741	19:13033	OSTI; NTIS (US Sales Only); INIS		DE94618339	
CEA-R–					
5643	19:12672	OSTI; NTIS (US Sales Only); INIS		DE94617433	
5647	19:11630	OSTI; NTIS (US Sales Only); INIS		DE94617499	
5648	19:12636	OSTI; NTIS (US Sales Only); INIS		DE94617430	
5649	19:13393	OSTI; NTIS (US Sales Only); INIS		DE94618435	
CEA-SPhT–					
91-134	19:13437	OSTI; NTIS (US Sales Only); INIS		DE94618463	
91-179	19:13348	OSTI; NTIS (US Sales Only); INIS		DE94618358	
92-121	19:13349	OSTI; NTIS (US Sales Only); INIS		DE94618359	
92-134	19:13438	OSTI; NTIS (US Sales Only); INIS		DE94618464	
CERN-TH–					
6928/93	19:13572	*See* DESY–93-079			
CFFTP-G–					
9198	19:12695	OSTI; NTIS (US Sales Only); INIS		DE94612870	
CMR–					
92-A15013	19:11579	OSTI; NTIS		DE94743503	
92-A25047	19:11563	OSTI; NTIS		DE94743514	
92-A30008	19:11564	OSTI; NTIS; INIS		DE94740217	
CONF-690618–		(Radioactive waste management conference; Richland, WA (United States); 23-24 Jun 1969)			
	19:11665	*See* BNWL-C–119			
CONF-8512163–		(7. Miami international conference on alternative energy sources; Miami Beach, FL (United States); 5 Dec 1985)			
	19:12224	*See* INIS-mf–13753			

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CONF-8801186–		(15. Brazilian Congress on Zoology; Curitiba (Brazil); 31 Jan - 5 feb 1988)			
	19:13210	*See* INIS-BR–3284			
CONF-8807221–		(2. Brazilian Congress on Limnology; Cuiaba (Brazil); 24-28 Jul 1988)			
	19:13126	*See* INIS-BR–3282			
CONF-9003342–		(Symposium on maintenance planning and operations; Riyadh (Saudi Arabia); 17-19 Mar 1990)			
	19:12174	*See* INIS-mf–13751			
CONF-9005454–		(Workshop on Genetic Effects of Ionizing Radiation; Ottawa (Canada); 2 May 1990)			
	19:13224	*See* AECL–10230			
CONF-9007260–		(19. Brazilian Congress on Agricultural Engineering; Piracicaba (Brazil); 16-20 Jul 1990)			
	19:12642	*See* INIS-BR–3281			
CONF-9009108–		(International meeting on reduced enrichment for research and test reactors; Newport, RI (United States); 23-27 Sep 1990)			
	19:12197	*See* ANL/RERTR/TM–18			
CONF-9009315–		(20. international symposium on multiparticle dynamics; Gut Holmecke (Germany); 10-14 Sep 1990)			
	19:13563	*See* CRN-HE–90-02			
CONF-9010554–		(European seminar on improved energy efficiency in the process industries; Brussels (Belgium); 23-24 Oct 1990)			
	19:12418	*See* EUR–13541			
CONF-9103165–		(International conference on spin and isospin in nuclear interactions; Telluride, CO (United States); 11-15 Mar 1991)			
	19:13559	*See* CEA-LNS-Ph–91-32			
CONF-9104430–		(Foodstuffs preservation by ionization meeting; Casablanca (Morocco); 20 Apr 1991)			
	19:13213	*See* INIS-mf–13852			
CONF-9105151–		(Physical phenomena at high magnetic fields; Tallahassee, FL (United States); 15-18 May 1991)			
10	19:13916	*See* ANL/MSD/PP–73288			
CONF-9105222–		(5. workshop on perspectives in nuclear physics at intermediate energies; Trieste (Italy); 6-10 May 1991)			
	19:13752	*See* CEA-CONF–11434			
CONF-9105436–		(21. all-union conference on physics of charged particles interaction with crystals; Moscow (Russian Federation); 27 May 1991)			
	19:13905	*See* INIS-RU–361			
CONF-9105440–		(ICTP-BCSPIN Kathmandu Summer School; Kathmandu (Nepal); 19 May - 1 jun 1991)			
	19:13432	*See* CEA-CONF–11435			
CONF-9105441–		(19. International meeting on fundamental physics; St. Feliu de Guixols (Spain); 6-10 May 1991)			
	19:13614	*See* LAL–91-69			
CONF-9106452–		(4. international summer school on nuclear physics at the borderlines; Rabida (Spain); 17 Jun 1991)			
	19:13483	*See* CEA-CONF–10695			
CONF-9106454–		(Conference on Advanced Quantum Field Theory and Critical Phenomena; Como (Italy); 17-21 Jun 1991)			
	19:13347	*See* CEA-CONF–11438			
	19:13433	*See* CEA-CONF–11436			
	19:13434	*See* CEA-CONF–11437			
CONF-9107225–		(NATO Advanced Study Institute: New symmetry principles in quantum field theory; Cargese (France); 16-27 Jul 1991)			
	19:13435	*See* CEA-CONF–11440			

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CONF-9107247–		(Workshop on Nucleon-Antinucleon Interactions. NAN-91; Moscow (Russian Federation); 8-11 Jul 1991)			
	19:13560	*See* CEA-LNS-Ph–91-33			
CONF-9107276–		(5. Workshop on symmetry methods in physics; Obninsk (Russian Federation); 8-12 Jul 1991)			
	19:13873	*See* LYCEN–9117			
CONF-9108253–		(New Trends in Theoretical and Experimental Nuclear Physics; Predeal (Romania); 26 Aug - 7 sep 1991)			
	19:13670	*See* CEA-CONF–11443			
CONF-910835–		(European Physical Society (EPS) nuclear physics conference on hadronic structure and electromagnetic interactions; Amsterdam (Netherlands); 5-10 Aug 1991)			
	19:12851	*See* CEA-CONF–11441			
CONF-910838–		(International conference on physics in two dimensions; Neuchatel (Switzerland); 19-23 Aug 1991)			
	19:13390	*See* CEA-CONF–11442			
	19:13892	*See* CEA-CONF–11444			
CONF-9109483–		(25. International Symposium on Elementary Particle Theory; Gosen (Germany); 23-27 Sep 1991)			
	19:13436	*See* CEA-CONF–11445			
CONF-9109525–		(Symposium on polymer thermodynamics and radiation scattering; Strasbourg (France); 30 Sep - 1 oct 1991)			
	19:13392	*See* CEA-LLB–91-83			
CONF-9109529–		(Advisory group meeting on isotopic and geochemical precursors of earthquakes and volcanic eruptions; Vienna (Austria); 9-12 Sep 1991)			
	19:13082	*See* IAEA-TECDOC–726			
CONF-9109531–		(2. biophysical work meeting; Schlema (Germany); 11-13 Sep 1991)			
	19:13225	*See* BfS-ST–3/92			
CONF-9109533–		(International workshop on recent advances in human radiobiology; Ferrara (Italy); 19 Sep 1991)			
1	19:13234	*See* ETDE-IT–94-34			
CONF-9109534–		(International Joliot Curie conference on nuclear physics; Maubuisson (France); 16-21 Sep 1991)			
	19:13754	*See* CEA-DPhN–91-56			
CONF-9110332–		(International workshop on electroweak physics beyond the standard model; Valencia (Spain); 2-5 Oct 1991)			
	19:13615	*See* LAL–91-74			
CONF-9111167–		(Workshop on hyperon and hypernuclear physics with proton beams; Bloomington, IN (United States); 8-10 Nov 1991)			
	19:13561	*See* CEA-LNS-Ph–91-35			
CONF-9111280–		(1. Brazilian Congress on Polymers; Sao Paulo (Brazil); 5-7 Nov 1991)			
	19:12692	*See* INIS-BR–3283			
CONF-911208–		(International symposium on hypernuclear and strange particle physics - 20th international symposium of the Institute for Nuclear Study (INS) of the University of Tokyo; Shimoda (Japan); 9-12 Dec 1991)			
	19:13753	*See* CEA-CONF–11447			
CONF-9201171–		(Workshop on the PS-spin collider; Tsukuba (Japan); 31 Jan - 1 feb 1992)			
	19:12896	*See* KEK-PROC–93-5			
CONF-920305–		(Minerals, Metals, and Materials Society (TMS) annual meeting and exhibition; San Diego, CA (United States); 1-5 Mar 1992)			
5-Rev.1	19:12625	*See* UCRL-JC–107581			

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CONF-9203245–		(8. annual report of the Research Program for Air Pollution Prevention Measures of Kernforschungszentrum Karlsruhe GmbH (KfK); Karlsruhe (Germany); 17-19 Mar 1992)			
	19:13047	*See* KFK-PEF–95			
CONF-9203294–		(Regulatory aspects of medical devices for therapy; Rome (Italy); 19-20 Mar 1992)			
1	19:13159	*See* ETDE-IT–94-26			
CONF-9203297–		(IAEA technical committee meeting on microwave reflectometry for fusion plasma diagnostics; Abingdon (United Kingdom); 4-6 Mar 1992)			
	19:14002	*See* INIS-mf–13810			
CONF-9204121–		('93 international conference on nuclear waste management and environmental remediation; Innovative technologies for cleaning the environment: air, water, and soil; Prague (Czech Republic); Erice (Italy); 5-11 Sep 1993; 22-29 apr 1992)			
5	19:11859	*See* WHC-SA–1529			
CONF-9205399–		(International meeting on ventilation and air quality in school buildings; Rome (Italy); 28 May 1992)			
1	19:13318	*See* ETDE-IT–94-40			
2	19:12397	*See* ETDE-IT–94-38			
3	19:12398	*See* ETDE-IT–94-39			
CONF-9206227–		(15. international conference on neutrino physics; Granada (Spain); 7-13 Jun 1992)			
8	19:13647	*See* FNAL/C–92/261			
CONF-9206322–		(4. topical seminar on the standard model and just beyond; San Miniato (Italy); 1-5 Jun 1992)			
	19:12912	*See* DESY–93-014			
CONF-9206427–		(2. working meeting on physics at VLEPP; Protvino (Russian Federation); 2 Jun 1992)			
	19:13425	*See* INIS-RU–362			
	19:13426	*See* INIS-RU–363			
CONF-9206433–		(13. Brazillian congress on food science and technology; Sao Paulo (Brazil); 23-26 Jun 1992)			
	19:13206	*See* INIS-BR–3246			
	19:13207	*See* INIS-BR–3247			
	19:13208	*See* INIS-BR–3248			
	19:13209	*See* INIS-BR–3249			
CONF-9206436–		(16. Johns Hopkins workshop on current problems in particle theory; Goeteborg (Sweden); 8-10 Jun 1992)			
	19:13349	*See* CEA-SPhT–92-121			
CONF-9206437–		(2. Workshop on neural networks: from biology to high energy physics; Marciana Marina (Italy); 18-26 Jun 1992)			
	19:13623	*See* PCCF-RI–92-12			
	19:13624	*See* PCCF-RI–92-13			
CONF-9207143–		(4. general congress on nuclear energy; Rio de Janeiro (Brazil); 5-9 Jul 1992)			
	19:13282	*See* IPEN-PUB–387			
CONF-9207233–		(Workshop on negative ion formation and beam handling; Tsukuba (Japan); 27-28 Jul 1992)			
	19:12894	*See* KEK-PROC–92-17			
CONF-9208164–		(6. symmetries in science; Bregenz (Austria); 2-7 Aug 1992)			
	19:13370	*See* LYCEN–9242			
CONF-9208218–		(Predeal International Summer School in Physics on topics in atomic and nuclear collisions; Predeal (Romania); 31 Aug - 11 sep 1992)			
	19:13694	*See* LPCC–92-10			
	19:13798	*See* KFK–5127			
CONF-9208243–		(2. workshop on biofuels; Espoo (Finland); 24-30 Aug 1992)			
	19:11894	*See* NEI-FI–214			

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CONF-9208251--		(2. international school of theoretica physics: symmetry and structural properties of condensed matter; Poznan (Poland); 26 Aug - 2 sep 1992)			
	19:13369	*See* LYCEN--9234			
CONF-9209115--		(10. European congress on electron microscopy; Granada (Spain); 7-11 Sep 1992)			
3	19:13317	*See* ETDE-IT--94-22			
CONF-9209197--		(3. international workshop on chromosome 22; Philadelphia, PA (United States); 17-20 Sep 1992)			
Exc.	19:13150	*See* DOE/ER/61497--1			
CONF-920921--		(6. international symposium on small particles and inorganic clusters; Chicago, IL (United States); 16-22 Sep 1992)			
	19:13387	*See* LYCEN--9317			
CONF-920930--		(17. symposium on fusion technology (SOFT-17); Rome (Italy); 14-18 Sep 1992)			
	19:14141	*See* ENEA-RT-NUCL--92-24			
CONF-9209307--		(International workshop on laser deposition of advanced materials; Tito (Italy); 28-30 Sep 1992)			
Exc.	19:12601	*See* ENEA-RT-INN--92-40			
CONF-9209321--		(23. Workshop of the INFN Eloisatron Project "Properties of SUSY Particles"; Erice (Italy); 28 Sep - 4 oct 1992)			
	19:13484	*See* DESY--93-012			
CONF-9209420--		(IAEA technical committee meeting on research using small tokamaks; Wuerzburg (Germany); 28-29 Sep 1992)			
	19:13965	*See* INIS-mf--13779			
CONF-9209435--		(Structural design against accidental loads as part of the offshore safety case, ERA technology; London (United Kingdom); 23-24 Sep 1992)			
1	19:11563	*See* CMR--92-A25047			
CONF-9209445--		(Conference on integrable quantum field theories; Como (Italy); 13-19 Sep 1992)			
	19:13438	*See* CEA-SPhT--92-134			
CONF-920959--		(9. international symposium on gas flow and chemical lasers; Heraklion (Greece); 21-25 Sep 1992)			
Exc.	19:12788	*See* ENEA-RT-INN--92-20			
CONF-9210102--		(Workshop on biological applications of relativistic nuclei; Clermont-Ferrand (France); 14-16 Oct 1992)			
	19:13174	*See* PCCF-RI--93-08			
CONF-9210421--		(Institute of Electrical and Electronic Engineers Industry Applications Society (IEEE-IAS) annual conference; Houston, TX (United States); 4-9 Oct 1992)			
2	19:13326	*See* LBL--35037			
CONF-9210427--		(Workshop on electro-weak symmetry breaking at colliding beam facilities; Workshop on high energy physics: search for new phenomenon at colliding beam facilities; Workshop on high energy physics: study of top quartz at colliding beam facilities; Santa Cruz, CA (United States); New Haven, CT (United States); Madison, WI (United States); 11-12 Dec 1992; 2-3 oct 1992; 6-7 nov 1992)			
Vol.3	19:13515	*See* SLAC--428-Vol.3			
CONF-921101--		(16. Materials Research Society (MRS) fall meeting; Boston, MA (United States); 30 Nov - 5 dec 1992)			
	19:13902	*See* CEA-CONF--11448			
CONF-9211211--		(Radiative properties of hot dense matter conference; Santa Barbara, CA (United States); 2-6 Nov 1992)			
5	19:13928	*See* UCRL-JC--116851			

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CONF-9211275–		(1. National Forum of Science and Technology on Health; Caxambu (Brazil); 20-24 Nov 1992)			
	19:12700	*See* IPEN-PUB–390			
CONF-9211287–		(Workshop on electro-weak symmetry breaking at colliding beam facilities; Workshop on high energy physics: search for new phenomenon at colliding beam facilities; Workshop on high energy physics: study of top quartz at colliding beam facilities; Santa Cruz, CA (United States); New Haven, CT (United States); Madison, WI (United States); 11-12 Dec 1992; 2-3 oct 1992; 6-7 nov 1992)			
Vol.3	19:13515	*See* SLAC–428-Vol.3			
CONF-9211291–		(JLC-FFIR92: Japan linear collider-final focus interaction region workshop; Higashiizu (Japan); 25-27 Nov 1992)			
	19:12897	*See* KEK-PROC–93-6			
CONF-9211294–		(2. meeting of the working group tools for simulation and modelling in environmental applications of the computer science for environmental protection of the Society for Computer Science; Karlsruhe (Germany); 5-6 Nov 1992)			
Exc.	19:13027	*See* KFK–5159			
CONF-9211295–		(Food treatment with ionizing radiations: Scientific and sanitary aspects; Rome (Italy); 22 Nov 1992)			
1	19:13196	*See* ETDE-IT–94-41			
CONF-9211296–		(National symposium on development and current problems of prophylaxis in Bulgaria; Lovech (Bulgaria); 26-28 Nov 1992)			
	19:11880	*See* INIS-mf–13827			
	19:12194	*See* INIS-mf–13823			
	19:12195	*See* INIS-mf–13829			
	19:13272	*See* INIS-mf–13822			
	19:13273	*See* INIS-mf–13824			
	19:13274	*See* INIS-mf–13825			
	19:13275	*See* INIS-mf–13826			
	19:13276	*See* INIS-mf–13828			
	19:13277	*See* INIS-mf–13830			
	19:13278	*See* INIS-mf–13831			
	19:13279	*See* INIS-mf–13832			
	19:13280	*See* INIS-mf–13833			
	19:13281	*See* INIS-mf–13834			
CONF-9212113–		(SLAC/KEK ATF lattice workshop; Taukuba (Japan); 8-11 Dec 1992)			
	19:12895	*See* KEK-PROC–93-1			
CONF-921252–		(Workshop on electro-weak symmetry breaking at colliding beam facilities; Workshop on high energy physics: search for new phenomenon at colliding beam facilities; Workshop on high energy physics: study of top quartz at colliding beam facilities; Santa Cruz, CA (United States); New Haven, CT (United States); Madison, WI (United States); 11-12 Dec 1992; 2-3 oct 1992; 6-7 nov 1992)			
Vol.3	19:13515	*See* SLAC–428-Vol.3			
CONF-930005–		(Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Munich (Germany); Annecy (France); Hamburg (Germany); 1993; 1993; 1993)			
	19:13585	*See* DESY–93-153			
CONF-930006–		(Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Munich (Germany); Annecy (France); Hamburg (Germany); 1993; 1993; 1993)			
	19:13585	*See* DESY–93-153			

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CONF-930007–		(Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Workshop on 500 GeV e+e- linear collider; Munich (Germany); Annecy (France); Hamburg (Germany); 1993; 1993; 1993)			
	19:13585	*See* DESY–93-153			
CONF-9301107–		(U.S./Japan workshop on ion temperature gradient driven turbulent transport; Austin, TX (United States); 11-14 Jan 1993)			
2	19:13940	*See* ETDE-IT–94-14			
CONF-9301109–		(2. international conference on physics and astrophysics of quark-gluon plasma; Calcutta (India); 19-23 Jan 1993)			
	19:13755	*See* CEA-DSM-T–93-19			
CONF-9301126–		(International winter meeting on nuclear physics; Bormio (Italy); 31 Jan 1993)			
	19:12950	*See* IPNO-DRE–93-04			
	19:13704	*See* IPNO-DRE–93-07			
	19:13705	*See* IPNO-DRE–93-08			
	19:13756	*See* CRN–93-14			
	19:13779	*See* IPNO-DRE–93-12			
CONF-9301132–		(1. international workshop on B-physics at hadron machines (UNK B-workshop); Melnik (Czech Republic); 18-22 Jan 1993)			
	19:12932	*See* DESY–93-026			
CONF-930197–		(9. winter workshop on nuclear dynamics; Key West, FL (United States); 30 Jan - 6 feb 1993)			
	19:13778	*See* IPNO-DRE–93-06			
CONF-930205–		(Waste management '93; Tucson, AZ (United States); 28 Feb - 4 mar 1993)			
82	19:11667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000976	MF-802
CONF-9302117–		(Interdisciplinary workshop on statistical description of transport in astro- and nuclear physics; Les Houches (France); 2-11 Feb 1993)			
	19:13671	*See* CEA-CONF–11449			
CONF-9302160–		(Workshop on issues at the Fernald Environmental Management project; Cincinnati, OH (United States); 3-4 Feb 1993)			
	19:11700	*See* FEMP/SUB–068			
CONF-9302165–		(Meeting on Municipal and industrial wastes; Milan (Italy); 9-10 Feb 1993)			
1	19:11914	*See* ETDE-IT–94-33			
CONF-9302166–		(Conference on dosimetry in Defense studies; Arcueil (France); 3 Feb 1993)			
	19:12930	*See* CEA-CONF–11689			
CONF-930223–		(National energy modeling system users' conference; Arlington, VA (United States); 1-2 Feb 1993)			
	19:12296	*See* DOE/EIA–0566			
CONF-930319–		(International conference on nuclear and particle physics; Glasgow (United Kingdom); 30 Mar - 1 apr 1993)			
	19:13571	*See* DESY–93-071			
CONF-930322–		(International workshop on dynamics of disordered materials II; Grenoble (France); 22-24 Mar 1993)			
1	19:12479	*See* ANL/MSD/CP–78618			
CONF-9303228–		(Workshop on HERA: the new frontier for QCD; Durham (United Kingdom); 21-26 Mar 1993)			
	19:13577	*See* DESY–93-095			
	19:13578	*See* DESY–93-097			
CONF-9303255–		(207. American Chemical Society (ACS) national meeting; San Diego, CA (United States); 13-18 Mar 1993)			
1	19:12438	*See* UCRL-JC–115709			
CONF-9303257–		(Specialist research meeting on the nuclear physics and solid state physics by a radioactive nuclear beam; Kumatori (Japan); 23-24 Mar 1993)			
	19:13692	*See* KURRI-TR–377			

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CONF-9303258–		(5. international symposium on advanced nuclear energy research; Mito (Japan); 10-12 Mar 1993)			
	19:13896	*See* JAERI-M–93-228			
CONF-9303259–		(Society of Petroleum Engineers (SPE) production operations symposium; Society of Petroleum Engineers (SPE) production operations symposium; Lubbock, TX (United States); Oklahoma City, OK (United States); 20-21 Apr 1994; 21-23 mar 1993)			
1	19:11558	*See* SAND–94-0390C			
CONF-9303261–		(2. European biennial workshop on nuclear physics; Megeve (France); 29 Mar - 2 apr 1993)			
	19:13765	*See* GSI–93-25(prepr.)			
CONF-9303262–		(2. EUREKA industrial laser safety forum 1993; Coventry (United Kingdom); 28-30 Mar 1993)			
1	19:12718	*See* ETDE-IT–94-10			
CONF-9303263–		(1. international conference on mechanochemistry; Kosice (Ceylon); 22-27 Mar 1993)			
1	19:12490	*See* ETDE-IT–94-15			
CONF-9303264–		(12. national congress on vacuum science and technology; Bolzano (Italy); 23-26 Mar 1993)			
1	19:14160	*See* ETDE-IT–94-30			
CONF-9303265–		(4. Bar-Ilan Conference "Frontiers in Condensed Matter Physics"; Bar-Ilan (Israel); 15-18 Mar 1993)			
	19:13391	*See* CEA-CONF–11450			
CONF-9303266–		(Winter workshop on spectroscopy and structure of rare earth systems; Karpacz (Poland); 25-28 Mar 1993)			
	19:13418	*See* LYCEN–9315			
CONF-930332–		(Optical Society of America integrated photonics research topical meeting; Palm Springs, CA (United States); 22-25 Mar 1993)			
2	19:13422	*See* UCRL-JC–112218			
CONF-930352–		(2. Japan Society of Mechanical Engineers (JSME)/American Society of Mechanical Engineers (ASME) joint international conference on nuclear engineering; San Francisco, CA (United States); 21-24 Mar 1993)			
21	19:12119	*See* ETDE-IT–94-13			
CONF-9304148–		(Department of Energy Monte Carlo workshop; Irving, CA (United States); 28-29 Apr 1993)			
2	19:12690	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007224	MF-405
CONF-9304213–		(Actinides meeting; Buehl (Germany); 20-23 Apr 1993)			
	19:11628	*See* CEA-CONF–11423			
	19:12635	*See* CEA-CONF–11687			
CONF-9304229–		(2. international workshop on physics and experiments at linear e^+e^- colliders; European workshop at DESY; Waikoloa, HI (United States); 26 Apr - 3 may 1993)			
	19:13572	*See* DESY–93-079			
	19:13574	*See* DESY–93-088			
	19:13579	*See* DESY–93-102			
CONF-9304234–		(Workshop modelling in clinical radiobiology; Wuerzburg (Germany); 25-27 Apr 1993)			
	19:13161	*See* GSI–93-50(prepr.)			
CONF-9304235–		(Amorphous silicon technology; San Francisco, CA (United States); 12-16 Apr 1993)			
1	19:12603	*See* ETDE-IT–94-16			
2	19:12602	*See* ETDE-IT–94-11			
CONF-9304236–		(Workshop on fragmentation phenomena; Houches (France); 12-17 Apr 1993)			
	19:13761	*See* GANIL-P–93-14			
CONF-930475–		(Waste stream minimization and utilization innovative concepts - an experimental technology exchange; Austin, TX (United States); 22-23 Apr 1993)			
Vol.1	19:12431	*See* PNL-SA–22193-Vol.1			

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Vol.2	19:12432	*See* PNL-SA–22193-Vol.2			
CONF-930477–		(International workshop on emittance preservation in linear colliders; Tsukuba (Japan); 16-23 Apr 1993)			
	19:12898	*See* KEK-PROC–93-13			
CONF-930511–		(PAC '93: international particle accelerator conference; Washington, DC (United States); 17-20 May 1993)			
	19:12842	*See* LAL-RT–93-03			
512	19:12838	*See* FNAL/C–93/175			
513	19:12837	*See* FNAL/C–93/174			
514	19:12839	*See* FNAL/C–93/177			
CONF-9305155–		(Workshop on high intensity electron sources; Legnaro (Italy); 24-28 May 1993)			
3-Rev.1	19:13389	*See* UCRL-JC–112646-Rev.1			
CONF-9305203–		(International school seminar on heavy ion physics; Dubna (Russian Federation); 10-15 May 1993)			
	19:12942	*See* GANIL-P–93-11			
CONF-9305227–		(International Atomic Energy Agency (IAEA) technical committee meeting on pellet injection; Naka (Japan); 10-12 May 1993)			
	19:13956	*See* INIS-mf–13760			
CONF-9305231–		(International Atomic Energy Agency (IAEA) technical committee meeting; Trieste (Italy); 10-14 May 1993)			
3	19:13943	*See* ETDE-IT–94-23			
CONF-9305233–		(11. high frontier conference on bringing the vision of space into reality; Princeton, NJ (United States); 12 May 1993)			
2	19:12755	*See* UCRL-JC–114041			
CONF-9305239–		(11. international workshop on electron resonance ion sources; Groningen (Netherlands); 5-8 May 1993)			
	19:12854	*See* INS–993			
CONF-9305289–		(Center for Nonlinear Studies international conference on modeling the forces of nature; Los Alamos, NM (United States); 17-21 May 1993)			
2	19:13415	*See* LA-UR–94-614			
CONF-9305311–		(16. Kazimierz meeting on elementary particle physics: new physics with new experiments; Kazimierz (Poland); 24-28 May 1993)			
	19:13584	*See* DESY–93-138			
CONF-9305323–		(Engineered porous materials EXPO '93; Albuquerque, NM (United States); 4-6 May 1993)			
	19:12475	*See* SAND–93-2096			
CONF-9305325–		(2. conference on metrology assurance of nuclear energy: from theory to practical applications; Varna (Bulgaria); 30 May - 1 jun 1993)			
	19:11886	*See* INIS-mf–13792			
	19:11887	*See* INIS-mf–13796			
	19:12163	*See* INIS-mf–13783			
	19:12183	*See* INIS-mf–13784			
	19:12184	*See* INIS-mf–13789			
	19:12498	*See* INIS-mf–13794			
	19:12499	*See* INIS-mf–13795			
	19:12948	*See* INIS-mf–13791			
	19:13095	*See* INIS-mf–13782			
	19:13096	*See* INIS-mf–13788			
	19:13127	*See* INIS-mf–13797			
	19:13271	*See* INIS-mf–13787			
CONF-9305329–		(21. international meeting on fundamental physics; Madrid (Spain); 9-15 May 1993)			
	19:13581	*See* DESY–93-129			
CONF-9305330–		(Spring college on plasma physics; Miramare (Italy); 17 May - 11 jun 1993)			
	19:14049	*See* IPP–6/316			

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CONF-9305331--		(15. international symposium on molecular beams; Berlin (Germany); 16-21 May 1993)			
1	19:13839	*See* ETDE-IT--94-31			
CONF-930605--		(3. European conference on advanced materials and processes; Paris (France); 7-10 Jun 1993)			
1	19:12492	*See* ETDE-IT--94-35			
CONF-930608--		(Safewaste '93: the final disposal of nuclear waste; Avignon (France); 13-18 Jun 1993)			
3	19:11699	*See* ETDE-IT--94-25			
CONF-9306113--		(17. solar photochemistry research conference; Brainerd, MN (United States); 6-10 Jun 1993)			
2	19:13837	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006598	MF-401
CONF-9306258--		(Workshop on B physics at hadron accelerators; Snowmass, CO (United States); 21 Jun - 2 jul 1993)			
	19:13645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007961	MF-414
CONF-9306304--		(Institute of Electrical and Electronics Engineers (IEEE) world congress on computational intelligence; Orlando, FL (United States); 26 Jun - 2 jul 1993)			
1	19:12998	*See* SAND--93-4040C			
CONF-9306311--		(9. international colloquium on plasma processes; Antibes-Juan Les Pins (France); 6-11 Jun 1993)			
1	19:12792	*See* ETDE-IT--94-29			
CONF-930636--		(10. international conference on ultra-relativistic nucleus-nucleus collisions; Borlaenge (Sweden); 20-24 Jun 1993)			
12	19:13722	*See* BNL--49968			
13	19:13723	*See* BNL--49969			
CONF-930640--		(8. IEEE conference on real-time computer applications in nuclear, particle and plasma physics; Vancouver (Canada); 8-11 Jun 1993)			
	19:12933	*See* DESY--93-091			
CONF-930658--		(5. international conference on welding and melting by electron and laser beams; La Baule (France); 4-16 Jun 1993)			
2	19:12491	*See* ETDE-IT--94-27			
CONF-930702--		(1993 ASME pressure vessel and piping conference; Denver, CO (United States); 25-29 Jul 1993)			
55	19:12719	*See* ETDE-IT--94-24			
CONF-930711--		(18. international conference on the physics of electronic and atomic collisions; Aarhus (Denmark); 21-27 Jul 1993)			
	19:13861	*See* CEA-CONF--11451			
CONF-930713--		(10. detonation symposium; Boston, MA (United States); 12-16 Jul 1993)			
29	19:13010	*See* UCRL-JC--114186			
CONF-9307145--		(Workshop on electron nucleus scattering; Elba (Italy); 5-10 Jul 1993)			
3	19:13659	*See* SLAC-PUB--6328			
CONF-930715--		(Workshop on positron interactions with atoms, molecules and clusters; Bielefeld (Germany); 14-17 Jul 1993)			
1	19:13375	*See* BNL--49946			
CONF-9307151--		(1. international Bison conference; La Crosse, WI (United States); 27 Jul 1993)			
1	19:13065	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001138	MF-402
CONF-9307166--		(2. towards a major atmospheric Cerenkov detector workshop; Calgary (Canada); 17-18 Jul 1993)			
1	19:12977	*See* SLAC-PUB--6390			
CONF-9307167--		(105. annual meeting of the Astronomical Society of the Pacific; San Diego, CA (United States); 10-15 Jul 1993)			
1	19:13424	*See* UCRL-JC--115464			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9307168–		(International symposium on generalized symmetries in physics; Clausthal (Germany); Jul 1993)			
	19:13345	*See* BONN-HE–93-28			
CONF-9307169–		(20. EPS conference on controlled fusion and plasma physics; Lisboa (Portugal); 24-31 Jul 1993)			
1	19:14159	*See* ETDE-IT–94-12			
CONF-930719–		(Conference on the bubble chamber and its role in particle physics; Geneva (Switzerland); 14-16 Jul 1993)			
	19:13619	*See* MPI-PhE–93-18			
CONF-930722–		(Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE); San Diego, CA (United States); 11-16 Jul 1993)			
59	19:12548	*See* UCRL-JC–114794			
CONF-930749–		(34. annual meeting of the Institute of Nuclear Materials Management; Scottsdale, AZ (United States); 18-21 Jul 1993)			
74	19:11634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000370	MF-513
CONF-930787–		(9. annual coal preparation, utilization, and environmental control contractors' conference; Pittsburgh, PA (United States); 19-22 Jul 1993)			
6	19:12037	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006989	MF-104
CONF-9308116–		(Joint meeting of the Canadian Mathematical Society, the American Mathematical Society, and the Mathematical Association of America on computation 1943-1993; Vancouver (Canada); 15-19 Aug 1993)			
1	19:14236	*See* ANL/MCS/CP–81883			
CONF-9308137–		(1993 summer national American Institute of Chemical Engineers (AIChE) conference; Seattle, WA (United States); 15-18 Aug 1993)			
10	19:11854	*See* PNL-SA–22008			
CONF-9308165–		(BIOMAG 93: international conference on biomagnetism; Vienna (Austria); 16-20 Aug 1993)			
3	19:13167	*See* LA-UR–94-78			
CONF-9308167–		(20. annual review of progress in quantitative nondestructive evaluation (NDE); Brunswick, ME (United States); 1-6 Aug 1993)			
6	19:12994	*See* PNL-SA–22301			
CONF-9308181–		(Pre-equilibrium Parton dynamics; Berkeley, CA (United States); 23 Aug - 3 sep 1993)			
2	19:13514	*See* LBL–34911			
CONF-9308196–		(Interagency symposium on property rights; Orlando, FL (United States); 7 Aug 1993)			
1	19:12295	*See* PNL-SA–22929			
CONF-9308200–		(3. workshop on verification of arms reduction; Geneva (Switzerland); 23-26 Aug 1993)			
1	19:12466	*See* ANL/EP/CP–81431			
CONF-9308203–		(4. international symposium on system research, informatics and cybernetics; Baden-Baden (Germany); 3-4 Aug 1993)			
1	19:14261	*See* LBL–31742			
CONF-9308213–		(2. international conference on lasers and their applications; Teheran (Iran, Islamic Republic of); 23-26 Aug 1993)			
	19:13842	*See* INIS-mf–13749			
CONF-9308215–		(ICO-16 satellite conference on active and adaptive optics; Garching (Germany); 2-5 Aug 1993)			
1	19:12987	*See* UCRL-JC–114837			
CONF-9308218–		(2. international workshop on strong microwaves in plasmas; Nizhny Novgorod (Russian Federation); 15-22 Aug 1993)			
1	19:14158	*See* ETDE-IT–94-09			
CONF-9308219–		(Iran's Physics Conference; Kermanshah (Iran, Islamic Republic of); 30 Aug - 2 sep 1993)			
	19:13342	*See* INIS-mf–13780			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-930823–		(16. international symposium on lepton and photon interactions; Ithaca, NY (United States); 10-15 Aug 1993)			
	19:13655	*See* MPI-PhE–93-24			
20	19:13588	*See* FNAL/C–93/207-E			
21	19:13589	*See* FNAL/C–93/210-E			
CONF-930888–		(Meeting on physics of high-energy particles in toroidal systems; Irvine, CA (United States); 30 Aug - 1 sep 1993)			
1	19:13936	*See* DOE/ET/53088–637			
CONF-930906–		('93 international conference on nuclear waste management and environmental remediation; Innovative technologies for cleaning the environment: air, water, and soil; Prague (Czech Republic); Erice (Italy); 5-11 Sep 1993; 22-29 apr 1992)			
20	19:11859	*See* WHC-SA–1529			
CONF-9309111–		(10. annual international Pittsburgh coal conference: coal - energy and the environment; Pittsburgh, PA (United States); 20-24 Sep 1993)			
6	19:11515	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006988	MF-104
CONF-9309119–		(9. biennial topical conference on atomic processes in plasmas; San Antonio, TX (United States); 19-23 Sep 1993)			
4	19:13931	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007212	MF-420
5	19:13932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006555	MF-426
CONF-930913–		(Global '93: future nuclear systems - emerging fuel cycles and waste disposal options; Seattle, WA (United States); 12-17 Sep 1993)			
	19:11629	*See* CEA-CONF–11678			
CONF-9309148–		(7. international workshop on the physics of nonideal plasmas; Rostock (Germany); 27 Sep - 1 oct 1993)			
1	19:13891	*See* UCRL-JC–115806			
CONF-9309166–		(4. international conference on calorimetry in high-energy physics; Elba (Italy); 19-25 Sep 1993)			
3	19:12939	*See* FNAL/C–94/030-E			
CONF-9309173–		(8. symposium on capture gamma-ray spectroscopy and related topics; Fribourg (Switzerland); 20-24 Sep 1993)			
9	19:13696	*See* UCRL-JC–113392			
CONF-9309199–		(Society of Photo-Optical Instrumentation Engineer's (SPIE) international symposium on optical tools for manufacturing and advanced automation; Boston, MA (United States); 7-10 Sep 1993)			
8	19:12665	*See* UCRL-JC–112979			
CONF-9309203–		(Ad-hoc workshop on ceramics for LI/SEs2 batteries; Oak Brook, IL (United States); 29-30 Sep 1993)			
	19:12292	*See* ANL/CMT/PROC–81920			
CONF-9309228–		(Focus 93: site characterization and model validation; Las Vegas, NV (United States); 26-29 Sep 1993)			
9	19:11956	*See* UCRL-JC–114798			
CONF-9309253–		(12. meeting on physics of nuclear fissions; Obninsk (Russian Federation); 27-30 Sep 1993)			
2	19:13808	*See* UCRL-JC–114757			
CONF-930926–		(13. international conference on magnet technology; Victoria (Canada); 20-24 Sep 1993)			
30	19:12979	*See* UCRL-JC–115217			
CONF-930927–		(3. conference of the European Ceramic Society; Madrid (Spain); 13-17 Sep 1993)			
3	19:12571	*See* ETDE-IT–94-20			
CONF-930928–		(6. international conference on fusion reactor materials; Stresa (Italy); 27 Sep - 1 oct 1993)			
28	19:14202	*See* UCRL-JC–114789			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9309290–		(4. international conference on x-ray microscopy; Chenogolovka (Russian Federation); 20-24 Sep 1993)			
2	19:13149	*See* UCRL-JC–115163			
CONF-9309294–		(Workshop on intakes of radionuclides; Bath (United Kingdom); 13-17 Sep 1993)			
1	19:13304	*See* PNL-SA–21948			
CONF-9309297–		(23. international symposium on multiparticle dynamics; Aspen, CO (United States); 13-17 Sep 1993)			
4	19:13516	*See* ANL-HEP-CP–94-9			
5	19:13630	*See* SLAC-PUB–6430			
6	19:13590	*See* FNAL/C–93/359-E			
7	19:13720	*See* BNL–49875			
8	19:13491	*See* FNAL/C–93/404-E			
CONF-9309301–		(Conference on addressing solid waste problems in the Pacific Northwest: working together to reach solutions; Richland, WA (United States); 23-24 Sep 1993)			
1	19:13106	*See* PNL-SA–22991			
CONF-9309330–		(2. Compton symposium; College Park, MD (United States); 20-22 Sep 1993)			
1	19:13421	*See* SLAC-PUB–6406			
CONF-9309333–		(5. International Symposium on Refined Flow Modelling and Turbulence Measurements; Paris (France); 7-10 Sep 1993)			
	19:12759	*See* CEA-CONF–11463			
CONF-9309335–		(Pulp and paper mill of the future conference; Orono, ME (United States); 8-10 Sep 1993)			
1	19:12323	*See* SAND–93-2004C			
CONF-9309337–		(Workshop on advances in smooth particle hydrodynamics; Los Alamos, NM (United States); 21-23 Sep 1993)			
1	19:13414	*See* LA-UR–93-4375			
CONF-9309341–		(23. European microwave conference; Madrid (Spain); 6-9 Sep 1993)			
1	19:14140	*See* ENEA-RT-ERG-FUS–93-08			
CONF-930956–		(Biennial conference of the Electron Microscopy and Analysis Group of the Institute of Physics: recent advances in electron microscopy and related microanalytical techniques; Liverpool (United Kingdom); 14-17 Sep 1993)			
2	19:12563	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007209	MF-404
CONF-930960–		(6. international conference on accelerator mass spectrometry; Canberra (Australia); 17 Sep - 1 oct 1993)			
2	19:13154	*See* UCRL-JC–114785			
8	19:12995	*See* UCRL-JC–114145			
9	19:12981	*See* UCRL-JC–115791			
10	19:13801	*See* LA-UR–94-441			
CONF-930999–		(NATO Advanced Study Institute on hot and dense nuclear matter; Bodrum (Turkey); 26 Sep - 9 oct 1993)			
7	19:13721	*See* BNL–49938			
CONF-931009–		(Fall meeting of the Minerals, Metals and Materials Society: physical metallurgy and materials; Pittsburgh, PA (United States); 17-21 Oct 1993)			
20	19:12564	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007211	MF-220
21	19:12529	*See* LA-UR–93-4520			
CONF-9310100–		(Human Factors and Ergonomics Society meeting; Seattle, WA (United States); 11-15 Oct 1993)			
8	19:14264	*See* PNL-SA–21969			
CONF-9310102–		(4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993)			
44	19:13341	*See* UCRL-JC–115254			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9310164–		(International symposium on substance identification technologies; Innsbruck (Austria); 4-8 Oct 1993)			
8	19:12985	*See* PNL-SA–22151			
CONF-9310167–		(64. shock and vibration symposium; Ft. Walton Beach, FL (United States); 25-28 Oct 1993)			
6	19:12711	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007214	MF-400
CONF-931018–		(Symposium on fusion engineering; Hyannis, MA (United States); 11-15 Oct 1993)			
80	19:14198	*See* UCRL-JC–114264			
81	19:14201	*See* UCRL-JC–114269			
82	19:14197	*See* UCRL-JC–114262			
84	19:14200	*See* UCRL-JC–114266			
85	19:14199	*See* UCRL-JC–114265			
CONF-9310185–		(16. international meeting on reduced enrichment for research and test reactors (RERTR); Ibaraki (Japan); 3-7 Oct 1993)			
9	19:12196	*See* ANL/EP/CP–81423			
CONF-9310220–		(Institute of Electrical and Electronic Engineers (IEEE) meeting on scalable parallel libraries; Starkville, MS (United States); 6-8 Oct 1993)			
5	19:13110	*See* UCRL-JC–115602			
CONF-9310247–		(9. workshop on proton-antiproton collider physics; Tsukuba (Japan); 18-22 Oct 1993)			
12	19:13592	*See* FNAL/C–93/388-E			
13	19:13591	*See* FNAL/C–93/362-E			
14	19:13594	*See* FNAL/C–94/016-E			
15	19:13595	*See* FNAL/C–94/017-E			
16	19:12938	*See* FNAL/C–94/023-E			
17	19:13650	*See* FNAL/C–94/021-E			
18	19:13652	*See* FNAL/C–94/036-E			
19	19:13649	*See* FNAL/C–94/014-E			
20	19:13648	*See* FNAL/C–94/006-E			
21	19:13596	*See* FNAL/C–94/035-E			
CONF-9310250–		(LATTICE 93: international symposium on lattice field theory; Dallas, TX (United States); 12-17 Oct 1993)			
	19:13488	*See* DESY–93-144			
CONF-9310252–		(2. gamma-ray burst workshop; Huntsville, AL (United States); 20-22 Oct 1993)			
5	19:13423	*See* UCRL-JC–114984			
CONF-9310259–		(U.S./Japan seminar on hyperon-nucleon interactions; Maui, HI (United States); 24-28 Oct 1993)			
2	19:13519	*See* BNL–49921			
3	19:13616	*See* LA-UR–94-676			
4	19:13651	*See* FNAL/C–94/031			
5	19:13593	*See* FNAL/C–93/403-E			
CONF-9310261–		(SCIFI 93: workshop on scintillating fiber detectors; South Bend, IN (United States); 24-28 Oct 1993)			
4	19:12937	*See* FNAL/C–94/018			
CONF-9310272–		(Symposium on recovery and effective reuse of discarded materials and by-products for construction of highway facilities; Denver, CO (United States); 19-22 Oct 1993)			
1	19:12416	*See* DOE/MC/28060–94/C0276			
CONF-9310276–		(8. wildland shrub and arid land restoration symposium; Las Vegas, NV (United States); 19-21 Oct 1993)			
3	19:13076	*See* EGG–11265-2029			
CONF-9310281–		(Eliminations of two atomic electrons by single high energy photon; Argonne, IL (United States); 4-5 Oct 1993)			
1	19:13867	*See* ANL/PHY/CP–81852			
CONF-9310282–		(Workshop on advanced components for electric and hybrid electric vehicles; Gaithersburg, MD (United States); 27-28 Oct 1993)			
1	19:12456	*See* UCRL-JC–115425			
2	19:12455	*See* UCRL-JC–115382			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9310283–		(4. Maryland conference on astrophysics; College Park, MD (United States); 11-13 Oct 1993)			
1	19:13420	*See* SLAC-PUB–6405			
CONF-9310284–		(6. advanced ICFA beam dynamics workshop; Madeira (Portugal); 24-30 Oct 1993)			
1	19:12843	*See* LBL–35058			
2	19:12841	*See* FNAL/C–94/020			
3	19:12840	*See* FNAL/C–94/019			
CONF-9310285–		(Institute of Electrical and Electronic Engineers-Industry Applications Society (IEEE-IAS) annual meeting; Ontario (Canada); 2-8 Oct 1993)			
1	19:12405	*See* LBL–35036			
CONF-9310290–		(Workshop on postacceleration issues at the IsoSpin Laboratory (ISL); Berkeley, CA (United States); 27-29 Oct 1993)			
1	19:12852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007220	MF-413
CONF-9310293–		(NATO Advanced Study Institute on hot and dense nuclear matter; Bodrum (Turkey); 5 Oct 1993)			
1	19:13802	*See* LA-UR–94-713			
CONF-9310294–		(International workshop on model uncertainty: its characterization and quantification; Annapolis, MD (United States); 20-22 Oct 1993)			
1	19:14260	*See* LA-UR–94-605			
CONF-9310296–		(International workshop on radioactive nuclear beams produced by fragment-separation techniques; Varna (Bulgaria); 12-15 Oct 1993)			
	19:13770	*See* GSI–93-74(prepr.)			
CONF-9310301–		(Pollutec: Study on behaviour in long term of vitrified materials; Paris (France); 14 Oct 1993)			
	19:11666	*See* CEA-CONF–11686			
CONF-9310302–		(4. International symposium on orthogonal polynomials and their applications; Evian (France); 19-23 Oct 1993)			
	19:13371	*See* LYCEN–9324			
CONF-931043–		(8. symposium on separation science and technology for energy applications; Knoxville, TN (United States); 24-28 Oct 1993)			
10	19:11733	*See* PNL-SA–21829			
CONF-931048–		(11. international workshop on laser interaction and related plasma phenomena; Monterey, CA (United States); 25-29 Oct 1993)			
1	19:12434	*See* SAND–93-3961C			
6	19:11893	*See* UCRL-JC–114495			
7	19:14203	*See* UCRL-JC–114966			
8	19:14207	*See* UCRL-JC–115197			
9	19:14204	*See* UCRL-JC–114969			
10	19:12809	*See* LA-UR–94-528			
CONF-931054–		(25. Boulder damage symposium: annual symposium on optical materials for high-power lasers; Boulder, CO (United States); 27-29 Oct 1993)			
7	19:12626	*See* UCRL-JC–113493			
8	19:14206	*See* UCRL-JC–114998			
9	19:12821	*See* UCRL-JC–115120			
10	19:14205	*See* UCRL-JC–114997			
CONF-931079–		(Water reactor safety information meeting; Bethesda, MD (United States); 25-27 Oct 1993)			
17	19:12126	*See* ANL/ET/CP–80141			
18	19:12282	*See* UCRL-JC–114806			
CONF-931080–		(Visualization '93; San Jose, CA (United States); 25-29 Oct 1993)			
5	19:13169	*See* LA-UR–94-0165			
CONF-931081–		(34. ORNL/DOE conference on analytical chemistry in energy technology; Gatlinburg, TN (United States); 5-7 Oct 1993)			
Absts.	19:12637	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007130	MF-401

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CONF-931095–		(Department of Energy environmental remediation conference; Augusta, GA (United States); 24-28 Oct 1993)			
73	19:11855	*See* PNL-SA–22431			
77	19:11846	*See* FEMP–2291			
CONF-931102–		(International conference on speed technology for railway and maglev vehicles; Yokohama (Japan); 22-25 Nov 1993)			
3	19:12410	*See* ANL/ES/CP–82064			
CONF-931107–		(1993 IEEE nuclear science symposium and medical imaging conference; San Francisco, CA (United States); 2-5 Nov 1993)			
33	19:12980	*See* UCRL-JC–115703			
35	19:12925	*See* BNL–49816			
CONF-931108–		(Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 29 Nov - 3 dec 1993)			
67	19:12619	*See* PNL-SA–22718			
70	19:12565	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006560	MF-404
77	19:12663	*See* SAND–93-1635C			
78	19:12620	*See* SAND–93-1545C			
79	19:12627	*See* UCRL-JC–113900			
80	19:12683	*See* UCRL-JC–116104			
81	19:11766	*See* UCRL-JC–115488			
82	19:12631	*See* UCRL-JC–115796			
83	19:12596	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007245	MF-404
84-Pt.2	19:12547	*See* UCRL-JC–114159-Pt.2			
85	19:12588	*See* SAND–93-3872C			
87	19:12584	*See* LA-UR–94-310			
90	19:12550	*See* UCRL-JC–116117			
91	19:12590	*See* UCRL-JC–114133			
CONF-9311104–		(40. national symposium of the American Vacuum Society (AVS); Orlando, FL (United States); 15-19 Nov 1993)			
15	19:14161	*See* GA-A–21487			
CONF-9311109–		(Todai symposium on frontiers in high magnetic fields; Tokyo (Japan); 10-12 Nov 1993)			
2	19:12583	*See* LA-UR–93-3456			
CONF-9311115–		(Symposium on science of advanced batteries; Cleveland, OH (United States); 8-9 Nov 1993)			
2	19:12293	*See* BNL–60038			
CONF-9311140–		(IAEA meeting on radio-frequency launchers for plasma heating and current drive; Naka (Japan); 10-12 Nov 1993)			
2	19:13948	*See* GA-A–21518			
CONF-9311141–		(30. joint Army, Navy, NASA, Air Force (JANNAF) combustion meeting; Monterey, CA (United States); 15-19 Nov 1993)			
2	19:13000	*See* UCRL-JC–115710			
CONF-9311144–		(International ATomic Energy Association (IAEA) specialists meeting on experience in the application of exemption principles; Vienna (Austria); 1-5 Nov 1993)			
1	19:11856	*See* PNL-SA–22796			
CONF-9311146–		(TIMS/ORSA joint national meeting; Phoenix, AZ (United States); 1-3 Nov 1993)			
1	19:14225	*See* PNL-SA–23192			
CONF-9311147–		(IAEA meeting on H-mode physics; Naka (Japan); 15-17 Nov 1993)			
4	19:13949	*See* GA-A–21520			
5	19:13952	*See* GA-A–21554			
6	19:13951	*See* GA-A–21541			
CONF-9311149–		(Interagency Advanced Power Group (IAPG) mechanical meeting; Albuquerque, NM (United States); 3-4 Nov 1993)			
Summ.	19:12285	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004954	MF-220
CONF-9311151–		(1993 electron beam melting and refining state of the art; Reno, NV (United States); 5 Nov 1993)			
2	19:12437	*See* UCRL-JC–114578			

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CONF-9311152–		(1993 annual Information Dimensions Exchange Association meeting; San Diego, CA (United States); 15-19 Nov 1993)			
1	19:14235	*See* ANL/IPD/CP–81274			
CONF-9311153–		(Materials Research Society meeting; Pittsburgh, PA (United States); 29 Nov - 3 dec 1993)			
2	19:12566	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007208	MF-404
CONF-9311155–		(Fly wheel energy storage technology workshop; Oak Ridge, TN (United States); 2-4 Nov 1993)			
	19:12290	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008064	MF-310
CONF-9311158–		(Air and Waste Management Association international speciality conference; Pittsburgh, PA (United States); 7-12 Nov 1993)			
1	19:13049	*See* LA-UR–93-4245			
CONF-9311166–		(3. bioethics seminar; Fukui (Japan); 14 Nov 1993)			
1	19:13134	*See* LA-UR–93-4412			
CONF-9311171–		(Neural information processing systems (NIPS) conference; Denver, CO (United States); 30 Nov - 2 dec 1993)			
2	19:13152	*See* LA-UR–94-110			
CONF-9311172–		(2. international workshop on the identification of transcribed sequences; San Francisco, CA (United States); 7-8 Nov 1993)			
Absts.	19:13145	*See* DOE/ER/61490–1			
CONF-9311174–		(10. Brazilian Symposium on Hydric Resources; 1. Symposium on Hydric Resources of Cone Sul; Gramado (Brazil); 7-12 Nov 1993)			
	19:13040	*See* INIS-BR–3239			
	19:13125	*See* INIS-BR–3238			
CONF-9311183–		(Workshop on Paleohydrogeological Methods and their Applications for Radioactive Waste; Paris (France); 9-10 Nov 1993)			
	19:13120	*See* CEA-CONF–11643			
CONF-931121–		(Annual winter meeting of the American Society of Mechanical Engineers; New Orleans, LA (United States); 28 Nov - 3 dec 1993)			
35	19:11735	*See* PNL-SA–23007			
38	19:14271	*See* UCRL-JC–114598			
CONF-931132–		(Fall meeting of the Plasma Physics Division of the American Physical Society; St. Louis, MO (United States); 1-5 Nov 1993)			
2	19:14208	*See* UCRL-JC–115500			
CONF-931133–		(38. annual conference on magnetism and magnetic materials; Minneapolis, MN (United States); 15-18 Nov 1993)			
8	19:12546	*See* UCRL-JC–114136			
CONF-931145–		(Eastern regional meeting of the Society of Petroleum Engineers: doing more with less; Pittsburgh, PA (United States); 2-4 Nov 1993)			
1	19:11594	*See* DOE/METC/C–94/7120			
CONF-931156–		(Fuels technology contractors' review meeting; Morgantown, WV (United States); 16-18 Nov 1993)			
26	19:11423	*See* DOE/MC/24116–94/C0282			
27	19:11591	*See* DOE/MC/29077–94/C0288			
28	19:11585	*See* DOE/MC/28130–94/C0296			
29	19:11601	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000081	MF-123
30	19:11428	*See* DOE/MC/27391–94/C0283			
31	19:11589	*See* DOE/MC/26024–94/C0290			
32	19:12784	*See* DOE/MC/28182–94/C0303			
33	19:11586	*See* DOE/MC/30139–94/C0295			
34	19:11593	*See* DOE/MC/30070–94/C0289			
35	19:11588	*See* DOE/MC/25105–94/C0302			
36	19:11590	*See* DOE/MC/28240–94/C0301			
37	19:11600	*See* DOE/NBM–94000080			
38	19:11602	*See* DOE/MC/29240–94/C0280			
39	19:11599	*See* DOE/MC/27286–94/C0281			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-931160–		(American Nuclear Society (ANS) winter meeting; San Francisco, CA (United States); 14-18 Nov 1993)			
36	19:11737	*See* PNL-SA–23271			
41	19:12254	*See* ANL/RE/CP–81947			
CONF-931173–		(6. international workshop on atomic physics for ion-driven fusion; Santa Fe, NM (United States); 8-12 Nov 1993)			
1	19:12664	*See* SAND–94-8204			
CONF-931178–		(5. international Toki conference on plasma physics and controlled nuclear fusion: physics and technology of plasma heating and current drive; Toki (Japan); 16-19 Nov 1993)			
1	19:13950	*See* GA-A–21525			
CONF-931188–		(17. annual training resources and data exchange conference: integrating training requirements and expectations; Indianapolis, IN (United States); 15-17 Nov 1993)			
1	19:14230	*See* WHC-SA–2194			
2	19:11705	*See* KCP–613-5236			
CONF-931208–		(Winter simulation conference; Los Angeles, CA (United States); 12-15 Dec 1993)			
2	19:13323	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001131	MF-902; MF-905
CONF-931234–		(American Welding Society international conference on modeling and control of joining processes; Orlando, FL (United States); 8-10 Dec 1993)			
6	19:12482	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006557	MF-404
7	19:12553	*See* WSRC-MS–94-081			
8	19:12552	*See* WSRC-MS–94-080			
CONF-931237–		(LASERS '93: international conference on lasers and applications; Lake Tahoe, NV (United States); 6-10 Dec 1993)			
6	19:14209	*See* UCRL-JC–116080			
CONF-931242–		(2. desert technology conference; Kona, HI (United States); 5-10 Dec 1993)			
1	19:11739	*See* PNL-SA–23412			
CONF-931247–		(Strongly correlated electron materials; Los Alamos, NM (United States); 15-18 Dec 1993)			
7	19:13914	*See* ANL/MSD/CP–82054			
8	19:13920	*See* LA-UR–94-563			
9	19:12585	*See* LA-UR–94-343			
CONF-931248–		(Workshop on applications of accelerators; Stanford, CA (United States); 1-2 Dec 1993)			
	19:12825	*See* SLAC–430			
CONF-931249–		(International symposium on special functions, approximation, numericqal quadrature, and orthogonal polynomials; West Lafayette, IN (United States); 2-4 Dec 1993)			
1	19:14237	*See* ANL/MCS/CP–81897			
CONF-931250–		(Structure and reactions of unstable nuclei; Kyoto (Japan); 1-3 Dec 1993)			
1	19:13693	*See* LA-UR–94-0386			
CONF-931251–		(IMP workshop; Mexico City (Mexico); Dec 1993)			
1	19:13052	*See* LA-UR–94-229			
CONF-931252–		(1993 international symposium on nonlinear theory and its applications; Honolulu, HI (United States); 5-10 Dec 1993)			
1	19:13344	*See* ANL/PHY/CP–81870			
CONF-931253–		(Sessler symposium on beam physics; Berkeley, CA (United States); 6 Dec 1993)			
1	19:12830	*See* SLAC-PUB–6417			
CONF-931254–		(Orbit analysis workshop; Upton, NY (United States); 1-3 Dec 1993)			
1	19:12844	*See* ANL/ASD/CP–81176			
3	19:12831	*See* BNL–49654			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-931255–		(3. pacific polymer conference; Gold Coast (Australia); 13-17 Dec 1993)			
1	19:12628	*See* UCRL-JC–114787			
CONF-931256–		(Materials Research Society (MRS) meeting on gas-phase and surface chemistry in electronics materials processing; Boston, MA (United States); Dec 1993)			
1	19:12708	*See* SAND–94-8524			
CONF-931257–		(Electro Technical Laboratory (ETL) workshop on high temperature superconductors; Tokyo (Japan); 6-10 Dec 1993)			
1	19:12567	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007230	MF-404
CONF-940101–		(11. symposium on space nuclear power systems; Albuquerque, NM (United States); 9-13 Jan 1994)			
28	19:12161	*See* SAND–93-2204C			
29	19:12281	*See* SAND–93-2124C			
CONF-940114–		(International symposium on optoelectronic and microwave engineering; Los Angeles, CA (United States); 22-28 Jan 1994)			
3	19:13053	*See* LA-UR–94-606			
CONF-940115–		(74. American Meteorological Society annual meeting; Nashville, TN (United States); 23-28 Jan 1994)			
28	19:13340	*See* PNL-SA–23047			
31	19:13339	*See* PNL-SA–23042			
CONF-940121–		(Superconducting superlattices and multilayers and oxide superconductory physics and nanoengineering; Los Angeles, CA (United States); 23-28 Jan 1994)			
3	19:13919	*See* LA-UR–94-538			
CONF-940122–		(7. IWCC international workshop on critical currents in superconductors; Alpbach (Austria); 24-27 Jan 1994)			
2	19:12559	*See* ANL/MSD/CP–82175			
CONF-940131–		(5. annual symposium on global change studies; Nashville, TN (United States); 24-28 Jan 1994)			
5	19:13058	*See* PNL-SA–23229			
CONF-940132–		(International conference on millimeter and submillimeter waves; San Diego, CA (United States); 10-14 Jan 1994)			
1	19:14162	*See* GA-A–21517			
2	19:13915	*See* ANL/MSD/CP–82165			
CONF-940135–		(18. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 9-14 Jan 1994)			
3	19:12568	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006559	MF-332
CONF-940142–		(OE/LASE '94: conference on optics, electro-optics, and laser applications in science and engineering; Los Angeles, CA (United States); 22-29 Jan 1994)			
8	19:13165	*See* LA-UR–94-16			
9	19:13166	*See* LA-UR–94-17			
13	19:12742	*See* SAND–93-1526C			
14	19:12908	*See* UCRL-JC–116189			
15	19:13168	*See* LA-UR–94-100			
16	19:12756	*See* UCRL-JC–114401			
19	19:12903	*See* LA-UR–94-152			
20	19:12287	*See* SAND–93-1724C			
21	19:13872	*See* LA-UR–94-695			
22	19:13888	*See* SAND–94-0317C			
24	19:12817	*See* SAND–93-1785C			
CONF-940149–		(8. international forum on process analytical chemistry; Houston, TX (United States); 24-26 Jan 1994)			
2	19:11709	*See* LA-UR–94-187			
CONF-940152–		(32. aerospace sciences meeting and exhibit; Reno, NV (United States); 11-14 Jan 1994)			
2	19:12986	*See* SAND–93-1274C			

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CONF-940154–		(International conference on rapid product development; Stuttgart (Germany); 31 Jan 1994)			
1	19:12751	*See* SAND–94-0123C			
CONF-940158–		(Institute of Navigation national technical meeting; San Diego, CA (United States); 24-26 Jan 1994)			
1	19:12997	*See* SAND–93-2413C			
CONF-940161–		(17. nuclear physics symposium; Oaxtepec (Mexico); 3-7 Jan 1994)			
1	19:13562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006558	MF-413
2	19:13665	*See* BNL–49960			
CONF-940164–		(Counter proliferation technical conference; Colorado Springs, CO (United States); 25-27 Jan 1994)			
1	19:13004	*See* PNL-SA–23614			
CONF-940204–		(94. annual meeting of the Minerals, Metals and Materials Society; San Francisco, CA (United States); 27 Feb - 3 mar 1994)			
2	19:11627	*See* ANL/FC/CP–79712			
3	19:11625	*See* ANL/CMT/CP–80021			
5	19:12630	*See* UCRL-JC–115698			
CONF-940210–		(11. international seminar on primary and secondary battery technology and application; Deerfield Beach, FL (United States); 28 Feb - 3 mar 1994)			
1	19:12454	*See* LA-UR–94-659			
CONF-940211–		(27. midyear topical meeting of the Health Physics Society: managing radioactive and mixed waste; Albany, NY (United States); 13-17 Feb 1994)			
2	19:11772	*See* WSRC-MS–93-317			
4	19:13305	*See* PNL-SA–22828			
CONF-940214–		(Space 94: international conference and exposition on engineering, construction, and operations in space; Albuquerque, NM (United States); 26 Feb - 3 mar 1994)			
9	19:12750	*See* SAND–93-3829C			
CONF-940215–		(International symposium on actinides: processing and materials; San Francisco, CA (United States); 27 Feb - 3 mar 1994)			
4	19:11626	*See* ANL/CMT/CP–81050			
5	19:12549	*See* UCRL-JC–114908			
6	19:11765	*See* UCRL-JC–114906			
7	19:11631	*See* UCRL-JC–115273			
CONF-940221–		(1994 TMS annual meeting on actinides; San Francisco, CA (United States); 27 Feb - 3 mar 1994)			
3	19:12537	*See* SAND–94-0283C			
CONF-940222–		(Corrosion 94: National Association of Corrosion Engineers (NACE) international annual conference; Baltimore, MD (United States); 28 Feb - 4 mar 1994)			
8	19:11768	*See* WHC-SA–1985			
12	19:11734	*See* PNL-SA–22723			
13	19:12534	*See* PNL-SA–23410			
CONF-940225–		(Waste management '94; Tucson, AZ (United States); 27 Feb - 3 mar 1994)			
1	19:11750	*See* SAND–93-2174C			
2	19:11711	*See* LA-UR–94-362			
5	19:13028	*See* LA-UR–94-52			
6	19:11712	*See* LA-UR–94-363			
7	19:11710	*See* LA-UR–94-361			
13	19:11713	*See* LA-UR–94-409			
14	19:11774	*See* WSRC-MS–93-405			
18	19:11816	*See* ANL/CMT/CP–80853			
20	19:11659	*See* ANL/EA/CP–80825			
21	19:11820	*See* ANL/EA/CP–80956			
22	19:11819	*See* ANL/DIS/CP–80940			
23	19:11661	*See* ANL/EA/CP–80958			
24	19:11632	*See* ANL/EA/CP–80824			
25	19:11795	*See* ANL/CMT/CP–80861			

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26	19:11752	*See* SAND–93-2441C			
27	19:11812	*See* SAND–94-0276C			
28	19:11790	*See* WSRC-TR–93-681			
29	19:11660	*See* ANL/EA/CP–80957			
34	19:11817	*See* ANL/CMT/CP–80854			
35	19:11818	*See* ANL/DIS/CP–80823			
36	19:11821	*See* ANL/EA/CP–80969			
37	19:11716	*See* LA-UR–94-607			
38	19:13061	*See* ANL/CMT/CP–82019			
45	19:11775	*See* WSRC-MS–93-482			
46	19:11773	*See* WSRC-MS–93-380			
48	19:12655	*See* LA-UR–94-493			
49	19:11633	*See* ANL/EA/CP–80976			
50	19:11823	*See* ANL/EA/CP–80977			
51	19:11822	*See* ANL/EA/CP–80972			
52	19:13030	*See* SAND–93-3967C			
53	19:11757	*See* SAND–94-0658C			
54	19:11754	*See* SAND–93-3966C			
57	19:11850	*See* LA-UR–94-557			
58	19:11858	*See* PNL-SA–23727			
59	19:11740	*See* PNL-SA–23686			
60	19:11736	*See* PNL-SA–23035			
61	19:11738	*See* PNL-SA–23331			
62	19:11882	*See* PNL-SA–23650			
66	19:13019	*See* UCRL-JC–114681			
67	19:11777	*See* WSRC-MS–93-550			
69	19:11857	*See* PNL-SA–22797			
CONF-940226–		(9. advanced solid-state lasers meeting; Salt Lake City, UT (United States); 7-10 Feb 1994)			
4	19:12808	*See* LA-UR–94-526			
5	19:12816	*See* PNL-SA–23676			
CONF-940241–		(Structural materials technology - non-destructive technology conference; Atlantic City, NJ (United States); 23-25 Feb 1994)			
2	19:12780	*See* UCRL-JC–115704			
CONF-940245–		(1994 National Aeronautics and Space Administration pyrotechnic systems workshop; Albuquerque, NM (United States); 8-9 Feb 1994)			
3	19:13014	*See* SAND–93-1912C			
5	19:13020	*See* SAND–94-0441C			
CONF-940247–		(IS&T/Society of Photo-optical Instrumentation Engineers (SPIE) meeting on electronic imaging science and technology; San Jose, CA (United States); 6-10 Feb 1994)			
2	19:12324	*See* SAND–94-0196C			
CONF-940248–		(4. annual symposium on chemical oxidation; Nashville, TN (United States); 16-18 Feb 1994)			
1	19:12685	*See* DOE/ER/00038–3676			
CONF-940254–		(SPIE medical imaging conference; Newport Beach, CA (United States); 13-18 Feb 1994)			
1	19:13170	*See* LBL–35050			
CONF-940256–		(National Science Foundation (NSF) symposium on dynamic failure mechanics of modern materials; Pasadena, CA (United States); 3-5 Feb 1994)			
1	19:12536	*See* SAND–93-2679C			
CONF-940301–		(207. spring national meeting of the American Chemical Society (ACS); San Diego, CA (United States); 13-18 Mar 1994)			
8	19:11473	*See* ANL/CHM/CP–81165			
9	19:12702	*See* ANL/CHM/CP–81226			
10	19:11891	*See* ANL/CHM/CP–81280			
11	19:11475	*See* ANL/CHM/CP–81246			
12	19:11419	*See* ANL/CHM/CP–81245			
13	19:11472	*See* ANL/CHM/CP–81164			
14	19:11476	*See* ANL/CHM/CP–81657			
15	19:11474	*See* ANL/CHM/CP–81225			
16	19:11478	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007210	MF-400
17	19:12701	*See* ANL/CHM/CP–81151			

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18	19:12035	*See* SAND–94-0527C			
19	19:12621	*See* SAND–93-2474C			
CONF-940307–		(International symposium on nuclear material safeguards; Vienna (Austria); 14-18 Mar 1994)			
12	19:11877	*See* K/NSP–165			
15	19:12469	*See* LA-UR–94-0256			
16	19:12468	*See* LA-UR–94-164			
17	19:12467	*See* LA-UR–94-154			
19	19:11871	*See* BNL–49978			
CONF-940312–		(2. Probabilistic safety assessment and management conference (PSAM); San Diego, CA (United States); 20-24 Mar 1994)			
50	19:11771	*See* WSRC-MS–93-231			
CONF-940340–		(10. Institute of Electrical and Electronic Engineers (IEEE) conference on artificial intelligence for applications; San Antonio, TX (United States); 1-4 Mar 1994)			
1	19:13136	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002443	MF-408
CONF-940342–		(ECAPT '94: 3rd European concerted action meeting on process tomography; Lisbon (Portugal); 24-27 Mar 1994)			
1	19:12629	*See* UCRL-JC–115246			
CONF-940348–		(International symposium on energetic materials technology and exhibits; Orlando, FL (United States); 21-24 Mar 1994)			
3	19:13003	*See* LA-UR–94-444			
CONF-940353–		(Symposium on the application of geophysics to environmental and engineering problems; Boston, MA (United States); 27-31 Mar 1994)			
3	19:13329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007415	MF-902
4	19:11861	*See* WHC-SA–2304			
CONF-940362–		(21. American Meteorological Society conference on agricultural and forest meteorology; San Diego, CA (United States); 7-10 Mar 1994)			
1	19:13050	*See* LA-UR–93-4526			
CONF-940368–		(21. conference on agricultural and forest meteorology; Boston, MA (United States); Mar 1994)			
1	19:13051	*See* LA-UR–94-101			
CONF-940373–		(3. atmospheric radiation measurement (ARM) science team meeting; Norman, OK (United States); 1-5 Mar 1994)			
1	19:13328	*See* ANL/ER/CP–80451			
CONF-940374–		(Environmental issues and solutions in exploration, production, and refining; Houston, TX (United States); 2-4 Mar 1994)			
1	19:11574	*See* ANL/EA/CP–81981			
CONF-940377–		(International conference on advanced science and technology; Naperville, IL (United States); 1 Mar 1994)			
1	19:14233	*See* ANL/ECT/CP–82125			
CONF-940378–		(Radio frequency (RF) Expo West; San Jose, CA (United States); 23 Mar 1994)			
1	19:12810	*See* LA-UR–94-597			
CONF-940402–		(International topical meeting on the safety of advanced reactors; Pittsburgh, PA (United States); 18-20 Apr 1994)			
3	19:12283	*See* WHC-SA–2121			
4	19:12271	*See* LA-UR–94-121			
5	19:12259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007218	MF-522
CONF-940407–		(Topical meeting on advances in reactor physics; Knoxville, TN (United States); 11-14 Apr 1994)			
3	19:11860	*See* WHC-SA–2254			
4	19:12247	*See* SAND–93-3996C			
5	19:12246	*See* SAND–93-1925C			
9	19:12152	*See* ANL/RA/CP–80543			
10	19:12169	*See* ANL/RA/CP–81724			
11	19:12179	*See* ANL/RA/CP–81715			

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CONF-9404103–		(Colorado conference on iterative methods; Breckenridge, CO (United States); 4-10 Apr 1994)			
1	19:14272	*See* UCRL-JC–115840			
CONF-9404106–		(Royal Society of Chemistry conference; Durham (United Kingdom); 2-8 Apr 1994)			
1	19:13832	*See* ANL/CHM/CP–81637			
CONF-9404107–		(New Mexico conference on the environment; Albuquerque, NM (United States); 24-26 Apr 1994)			
1	19:13128	*See* LA-UR–94-521			
3	19:11963	*See* LA-UR–94-577			
CONF-9404109–		(Secur Tech conference; Crystal City, VA (United States); 11-13 Apr 1994)			
1	19:12470	*See* SAND–93-2470C			
CONF-940411–		(Spring meeting of the Materials Research Society; San Francisco, CA (United States); 4-8 Apr 1994)			
1	19:13890	*See* UCRL-JC–115625			
CONF-9404110–		(3. FedUNIX annual conference on system administration, networking, and security; Washington, DC (United States); 4-9 Apr 1994)			
1	19:14259	*See* LA-UR–94-604			
CONF-9404111–		(Society of Petroleum Engineers (SPE) production operations symposium; Society of Petroleum Engineers (SPE) production operations symposium; Lubbock, TX (United States); Oklahoma City, OK (United States); 20-21 Apr 1994; 21-23 mar 1993)			
1	19:11558	*See* SAND–94-0390C			
CONF-940412–		(39. international symposium of the Society for the Advancement of Material and Process Engineering and exhibition; Anaheim, CA (United States); 11-14 Apr 1994)			
4	19:12638	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006562	MF-404
CONF-940417–		(4. international conference on nuclear fuel reprocessing and waste management; London (United Kingdom); 24-28 Apr 1994)			
3	19:12253	*See* ANL/FC/CP–79262			
CONF-940422–		(5. global warming science and policy international conference and expo; San Francisco, CA (United States); 4-7 Apr 1994)			
1	19:13031	*See* ANL/ES/CP–82079			
CONF-940424–		(8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994)			
7	19:12902	*See* LA-UR–93-4512			
11	19:13800	*See* LA-UR–94-0384			
13	19:13816	*See* LA-UR–94-204			
14	19:13810	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006554	MF-405
15	19:13817	*See* LA-UR–94-260			
16	19:13023	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007229	
18	19:13011	*See* LA-UR–94-0153			
19	19:13022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007215	
20	19:13811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007219	MF-410
21	19:11867	*See* WSRC-MS–93-448			
22	19:13812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007221	MF-905
24	19:12922	*See* ANL-HEP-CP–94-08			
25	19:12845	*See* ANL/EA/CP–81915			
CONF-940428–		(High performance computing '94: grand challenges in computer simulation; La Jolla, CA (United States); 11-15 Apr 1994)			
1	19:13006	*See* SAND–93-2040C			
2	19:12773	*See* SAND–93-2556C			
CONF-940443–		(Globalcon: congress and exhibition for energy and environmental technologies; Anaheim, CA (United States); 6-7 Apr 1994)			
1	19:12350	*See* SAND–94-0552C			

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CONF-940449–		(Society of Photo-Optical Instrumentation Engineers conference on intelligent information systems; Orlando, FL (United States); 4-8 Apr 1994)			
1	19:13416	*See* LA-UR–94-691			
CONF-940451–		(Parallel processing symposium; Cancun (Mexico); 26-29 Apr 1994)			
1	19:13886	*See* LA-UR–93-3467			
CONF-940453–		(International reliability physics symposium; San Jose, CA (United States); 11-14 Apr 1994)			
2	19:12819	*See* SAND–94-0402C			
3	19:13900	*See* SAND–93-2429C			
CONF-940456–		(1994 Society for Computer Simulation multiconference; San Diego, CA (United States); 11-15 Apr 1994)			
8	19:11779	*See* WSRC-MS–93-606			
11	19:14234	*See* ANL/IFR/CP–80791			
12	19:12170	*See* ANL/RA/CP–81815			
CONF-940466–		(American Society of Civil Engineers (ASCE) structures congress; Atlanta, GA (United States); Apr 1994)			
1	19:12782	*See* Y/EN–4684			
CONF-940467–		(8. IEEE-USA careers conference; Dallas, TX (United States); 14-15 Apr 1994)			
2	19:14227	*See* UCRL-JC–115706			
CONF-940481–		(7. symposium on electromagnetic launch technology; San Diego, CA (United States); 20-24 Apr 1994)			
1	19:12906	*See* SAND–93-0092C			
3	19:12829	*See* SAND–93-1765C			
4	19:12828	*See* SAND–93-1764C			
CONF-940482–		(American Nuclear Society (ANS) topical meeting; Knoxville, TN (United States); 11-15 Apr 1994)			
1	19:11708	*See* LA-UR–93-4455			
2	19:12733	*See* LA-UR–93-4097			
CONF-940483–		(16. SPIE thermosense: international conference on thermal sensing and imaging and diagnostic applications; Orlando, FL (United States); 4-8 Apr 1994)			
1	19:12757	*See* UCRL-JC–115950			
2	19:13001	*See* EGG–11265-5013			
CONF-940501–		(9. Pacific basin nuclear conference; Sydney (Australia); 1-5 May 1994)			
1	19:11813	*See* WSRC-MS–93-523			
CONF-940506–		(8. international conference on computer methods and advances in geomechanics; Morgantown, WV (United States); 22-28 May 1994)			
1	19:11753	*See* SAND–93-2670C			
2	19:11510	*See* SAND–93-2566C			
3	19:11742	*See* SAND–93-0817C			
CONF-940510–		(Annual technical meeting and exposition of the Institute of Environmental Sciences; Rosemont, IL (United States); 1-6 May 1994)			
1	19:14269	*See* SAND–93-4104C			
CONF-940518–		(International conference on nuclear systems thermal hydraulics; Pisa (Italy); 30 May - 2 jun 1994)			
1	19:12258	*See* BNL-NUREG–49018			
CONF-940529–		(185. Electrochemical Society meeting; San Francisco, CA (United States); 22-27 May 1994)			
1	19:12591	*See* UCRL-JC–116378			
2	19:13016	*See* SAND–93-3865C			
CONF-940534–		(41. annual conference of the Society for Technical Communication; Minneapolis, MN (United States); May 1994)			
1	19:12333	*See* LA-UR–93-2793			
2	19:14257	*See* LA-UR–93-2864			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940537–		(7. international conference on silicon materials science and technology; San Francisco, CA (United States); 22-27 May 1994)			
1	19:12535	*See* SAND–93-2047C			
CONF-940538–		(48. annual quality congress; Las Vegas, NV (United States); 24-26 May 1994)			
1	19:14229	*See* WHC-SA–2050			
2	19:12199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94000483	MF-520
CONF-940550–		(Institute of Electrical and Electronics Engineers (IEEE) international conference on robotics; San Diego, CA (United States); 8-13 May 1994)			
1	19:12744	*See* SAND–93-2307C			
3	19:12747	*See* SAND–93-2352C			
4	19:12746	*See* SAND–93-2333C			
5	19:12748	*See* SAND–93-2380C			
6	19:12712	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002189	MF-406
7	19:12745	*See* SAND–93-2326C			
8	19:12713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002799	MF-906
9	19:12743	*See* SAND–93-2028C			
10	19:12714	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004427	MF-406
CONF-940551–		(American Ceramic Society (ACS) annual meeting; Indianapolis, IN (United States); May 1994)			
1	19:11787	*See* WSRC-TR–93-414			
CONF-940553–		(International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994)			
1	19:11776	*See* WSRC-MS–93-491			
2	19:11668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002789	MF-940
3	19:11669	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002790	MF-400
5	19:11755	*See* SAND–93-4097C			
11	19:11717	*See* LA-UR–94-715			
14	19:11756	*See* SAND–94-0107C			
CONF-940557–		(Instrumentation and measurement technology conference; Hammamatsu (Japan); 10-12 May 1994)			
1	19:12752	*See* SAND–94-0254C			
CONF-940563–		(Symposium on theory of computing; Montreal (Canada); 23-25 May 1994)			
1	19:14266	*See* SAND–93-2704C			
CONF-940566–		(International ultraviolet and electron beam curing conference and exhibition; Orlando, FL (United States); 1-5 May 1994)			
1	19:13823	*See* SAND–93-2077C			
2	19:13824	*See* SAND–93-2084C			
3	19:13825	*See* SAND–93-2085C			
CONF-940568–		(7. international meeting on lithium batteries; Cambridge, MA (United States); 15-20 May 1994)			
1	19:12294	*See* SAND–94-0380C			
CONF-940571–		(Networld + interop '94 engineer's conference; Las Vegas, NV (United States); 2-6 May 1994)			
1	19:14258	*See* LA-UR–93-4438			
CONF-940581–		(40. international instrumentation symposium; Baltimore, MD (United States); 1-5 May 1994)			
1	19:14267	*See* SAND–93-3979C			
CONF-940582–		(CLEO '94: conference on lasers and electro-optics; Anaheim, CA (United States); 8-13 May 1994)			
1	19:12822	*See* UCRL-JC–115687			
CONF-940588–		(1994 conference on GaAs manufacturing; Las Vegas, NV (United States); 2-5 May 1994)			
1	19:13887	*See* SAND–93-2702C			
CONF-940593–		(9. international conference on ultrafast phenomena; Dana Point, CA (United States); 1-5 May 1994)			
1	19:12669	*See* BNL–60012			
2	19:12670	*See* BNL–60013			

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CONF-940595–		(4. annual conference of the international DB2 users group; San Diego, CA (United States); 8-12 May 1994)			
1	19:14280	*See* WSRC-MS–94-029			
CONF-940596–		(44. electronic components and technology conference; Washington, DC (United States); 1-4 May 1994)			
1	19:12988	*See* UCRL-JC–116148			
2	19:12818	*See* SAND–94-0163C			
CPD–					
220-Add.	19:11670	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007872	MF-603
CRN–					
93-14	19:13756	OSTI; NTIS (US Sales Only); INIS		DE94618685	
93-19	19:13757	OSTI; NTIS (US Sales Only); INIS		DE94618686	
CRN-HE–					
90-02	19:13563	OSTI; NTIS (US Sales Only); INIS		DE94618527	
CTH-ED–					
241	19:13933	OSTI; NTIS; INIS		DE94617187	
DAPNIA-SPN–					
92-02.	19:13753	*See* CEA-CONF–11447			
DESY–					
92-169	19:13564	OSTI; NTIS (US Sales Only); INIS		DE94752380	
92-170	19:13565	OSTI; NTIS (US Sales Only); INIS		DE94752469	
93-010	19:13566	OSTI; NTIS (US Sales Only); INIS		DE94752381	
93-011	19:13567	OSTI; NTIS (US Sales Only); INIS		DE94752382	
93-012	19:13484	OSTI; NTIS (US Sales Only); INIS		DE94752385	
93-014	19:12912	OSTI; NTIS (US Sales Only); INIS		DE94752386	
93-018	19:13439	OSTI; NTIS (US Sales Only); INIS		DE94752384	
93-019	19:13568	OSTI; NTIS (US Sales Only); INIS		DE94752388	
93-020	19:12931	OSTI; NTIS (US Sales Only); INIS		DE94752383	
93-022	19:13646	OSTI; NTIS (US Sales Only); INIS		DE94752374	
93-025	19:13440	OSTI; NTIS (US Sales Only); INIS		DE94752376	
93-026	19:12932	OSTI; NTIS (US Sales Only); INIS		DE94752387	
93-027	19:13569	OSTI; NTIS (US Sales Only); INIS		DE94752375	
93-043	19:13394	OSTI; NTIS (US Sales Only)		DE94752471	
93-048	19:13570	OSTI; NTIS (US Sales Only); INIS		DE94752466	
93-049	19:13441	OSTI; NTIS (US Sales Only); INIS		DE94752462	
93-050	19:13442	OSTI; NTIS (US Sales Only); INIS		DE94752470	
93-055	19:13485	OSTI; NTIS (US Sales Only); INIS		DE94752468	
93-057	19:13350	OSTI; NTIS (US Sales Only); INIS		DE94752467	
93-070	19:13443	OSTI; NTIS (US Sales Only); INIS		DE94752465	
93-071	19:13571	OSTI; NTIS (US Sales Only); INIS		DE94752464	
93-074	19:13486	OSTI; NTIS (US Sales Only); INIS		DE94752396	
93-079	19:13572	OSTI; NTIS (US Sales Only); INIS		DE94752404	
93-081	19:13573	OSTI; NTIS (US Sales Only); INIS		DE94752405	
93-082	19:13395	OSTI; NTIS (US Sales Only)		DE94752407	
93-083	19:13444	OSTI; NTIS (US Sales Only); INIS		DE94747607	
93-088	19:13574	OSTI; NTIS (US Sales Only); INIS		DE94752406	
93-089	19:13575	OSTI; NTIS (US Sales Only); INIS		DE94752395	
93-090	19:13576	OSTI; NTIS (US Sales Only); INIS		DE94751735	
93-091	19:12933	OSTI; NTIS (US Sales Only); INIS		DE94752400	
93-094	19:13445	OSTI; NTIS (US Sales Only); INIS		DE94752397	
93-095	19:13577	OSTI; NTIS (US Sales Only); INIS		DE94752401	
93-097	19:13578	OSTI; NTIS (US Sales Only); INIS		DE94752403	
93-102	19:13579	OSTI; NTIS (US Sales Only); INIS		DE94752402	
93-106	19:13580	OSTI; NTIS (US Sales Only); INIS		DE94752398	
93-109	19:13487	OSTI; NTIS (US Sales Only); INIS		DE94752399	
93-128	19:13446	OSTI; NTIS (US Sales Only); INIS		DE94752173	
93-129	19:13581	OSTI; NTIS (US Sales Only); INIS		DE94752156	
93-131	19:13582	OSTI; NTIS (US Sales Only); INIS		DE94752172	
93-133	19:13447	OSTI; NTIS (US Sales Only); INIS		DE94747478	
93-134	19:13448	OSTI; NTIS (US Sales Only); INIS		DE94752171	
93-135	19:13583	OSTI; NTIS (US Sales Only); INIS		DE94752170	
93-136	19:13449	OSTI; NTIS (US Sales Only); INIS		DE94751946	
93-138	19:13584	OSTI; NTIS (US Sales Only); INIS		DE94752155	
93-140	19:13351	OSTI; NTIS (US Sales Only); INIS		DE94751734	
93-143	19:12934	OSTI; NTIS (US Sales Only); INIS		DE94751733	
93-144	19:13488	OSTI; NTIS (US Sales Only); INIS		DE94751966	
93-145	19:13450	OSTI; NTIS (US Sales Only); INIS		DE94751732	
93-153	19:13585	OSTI; NTIS (US Sales Only); INIS		DE94751947	

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DFPD–					
93/TH/43	19:13486	*See* DESY–93-074			
DFTUZ–					
93/01.	19:13412	*See* IPNO-TH–93-06			
DLR-Mitt.–					
93-04	19:11943	OSTI; NTIS (US Sales Only)		DE94752452	
DOE–					
94007260	19:11577	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007260	MF-121; MF-131
DOE-GT-MHR–					
100002	19:12143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007069	MF-522
DOE-HMIP-RR–					
93.033	19:11679	OSTI; NTIS (US Sales Only); INIS		DE94616528	
93/047	19:11680	OSTI; NTIS (US Sales Only); INIS		DE94618263	
DOE-RAS–					
93.004	19:13121	OSTI; NTIS (US Sales Only); INIS		DE94617786	
DOE/AL/58309–					
54	19:11671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007446	MF-902
DOE/AL/62350–					
100	19:11672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007199	MF-902
108	19:11830	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008245	MF-907
109	19:11831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008246	MF-902
53F-Rev.1	19:11826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006202	MF-902
78	19:11827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007201	MF-902
86	19:11828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003176	MF-902
90D	19:13066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007200	MF-902
92	19:11829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007198	MF-903
97D	19:13067	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007203	MF-902
DOE/BC–					
93/2	19:11538	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000147	PC-122
DOE/BC/14474–					
11	19:11532	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007804	MF-122
DOE/BC/14479–					
16	19:11598	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007803	MF-122
DOE/BC/14652–					
11	19:11533	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007802	MF-122
13	19:11539	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007801	MF-122
14	19:11540	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008190	MF-122
DOE/BC/14831–					
5	19:11541	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008187	MF-122
6	19:11542	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008188	MF-122
DOE/BC/14860–					
3	19:11543	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007799	MF-122
DOE/BC/14881–					
4	19:11544	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007800	MF-122
DOE/BC/14884–					
3	19:11545	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007797	MF-122
4	19:11546	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007798	MF-122
DOE/BC/14899–					
9	19:11547	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000116	PC-122
DOE/BC/14951–					
3	19.11548	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007796	MF-122
DOE/BC/14955–					
2	19:11549	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007793	MF-122
3	19:11550	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007794	MF-122
DOE/BC/14966–					
2	19:11534	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007792	MF-122
DOE/BP–					
1913	19:12396	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007587	MF-920
1975	19:12284	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005632	MF-920
1979	19:13131	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007589	MF-902
2256	19:12288	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007591	MF-902
2283	19:12105	*See* DOE/EIS–0194-Summ.			
2284	19:12106	*See* DOE/EIS–0194-Vol.1			
2285	19:12301	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007594	MF-630
2318	19:12339	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007592	MF-900
2325	19:12340	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008563	MF-900
62611-3	19:11937	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007593	MF-902
91819-5	19:13133	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007586	MF-902
DOE/BP/02737–					
4	19:11933	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005639	MF-902

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/BP/02886–					
1	19:13132	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006090	MF-902
DOE/BP/21182–					
1	19:11934	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005631	MF-902
2	19:11935	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007084	MF-902
DOE/BP/61176–					
1	19:11936	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007088	MF-902
DOE/BP/64458–					
1	19:13194	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007083	MF-908
DOE/BP/90299–					
1	19:11938	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007155	MF-902
DOE/BP/98635–					
1	19:11939	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006091	MF-902
DOE/BP/99893–					
T1	19:11979	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006210	MF-920
DOE/BPA–					
2000	19:11921	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007590	MF-902
DOE/CE/15558–					
T1	19:13068	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007448	MF-310
DOE/CE/23810–					
14	19:12597	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008552	MF-366
33C	19:12598	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007723	MF-366
DOE/CE/26615–					
T1	19:12441	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007016	MF-310
DOE/CE/40812–					
1	19:12411	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006747	PC-317
DOE/CE/40874–					
4	19:12412	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004170	MF-312
DOE/CE/90053–					
T60	19:12996	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007949	MF-220
T62	19:14211	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007951	MF-220
DOE/CH–					
9202	19:11832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007974	MF-600; MF-902
9215	19:12639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008065	MF-600; MF-902
DOE/CH/10093–					
199	19:12413	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000064	PC-310
246	19:12442	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018228	MF-249
257	19:11910	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000238	MF-247
264	19:11944	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000246	PC-270
DOE/DEIS–					
0201	19:12288	*See* DOE/BP–2256			
DOE/DP–					
0123T	19:11635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006619	MF-700
0124T	19:12330	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007246	MF-700
DOE/EA–					
0464-Rev.3	19:11833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007202	MF-902
DOE/EH–					
012b/0593	19:11580	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008194	MF-630
0360	19:13034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006425	MF-602
0364T	19:13227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007247	MF-607
231-012D/0194	19:11581	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008214	PC-630
231-012E/0593	19:11578	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008192	MF-630
231-0181/0992	19:12309	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008195	MF-630
231-021/0293	19:12302	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008213	MF-630
231-021/0993	19:11673	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008205	MF-600
231-022/0793	19:12303	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008210	MF-630
231-022/1193	19:12304	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008202	MF-630
231-023/0793	19:12305	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008208	MF-630
231-026/0593	19:11674	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008207	MF-630
231-033/0793	19:11675	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008193	MF-630
231-034/0593	19:12306	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008212	MF-630
231-035/0693	19:12307	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008211	MF-630
231-036/0793	19:12443	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008206	MF-600
231-039/1193	19:12308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008204	MF-603
94007658	19:12310	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007658	MF-630
DOE/EI/23956–					
T1	19:11604	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007020	MF-950
DOE/EIA–					
0109(94/02)	19:11565	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007963	MF-950

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DOE/EIA–					
0121(93/3Q)	19:11506	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007370	MF-950
0130(94/02)	19:11596	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007906	MF-950
0226(94/02)	19:12341	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007235	MF-950
0380(94/02)	19:11566	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007714	MF-950
0437(92)/2	19:12342	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007105	MF-950
0520(94/02)	19:11567	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007378	MF-950
0538(93/94-19)	19:11568	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007057	MF-950
0538(93/94-20)	19:11569	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007411	MF-950
0538(93/94-21)	19:11570	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007596	MF-950
0538(93/94-22)	19:11571	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008215	MF-950
0538(93/94-23)	19:11572	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008283	MF-950
0566	19:12296	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008256	MF-950
0570(92)	19:11655	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE94008252	MF-950
0575(94)	19:11535	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008249	MF-950
0576	19:11504	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE94007086	MF-950
M055	19:14241	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007964	MF-950
M056	19:14242	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007965	MF-950
DOE/EIS–					
0194-Summ.	19:12105	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007588	MF-630
0194-Vol.1	19:12106	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007595	MF-630
0194-Vol.2	19:12301	*See* DOE/BP–2285			
0200	19:12311	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007924	MF-600
0200-Exec.Summ.	19:12312	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007233	MF-900
DOE/EM–					
0139P	19:11676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007838	MF-940
94007053	19:11677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007053	MF-900
94007925	19:11678	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007925	MF-900
DOE/ER–					
0610T	19:12473	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007950	MF-404
DOE/ER/00035–					
3674	19:12691	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007973	MF-401
3676	19:12685	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006510	MF-401
DOE/ER/10666–					
10	19:12834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007954	MF-414
DOE/ER/13442–					
8	19:13862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007403	MF-412
DOE/ER/13480–					
4	19:12705	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007607	MF-401
DOE/ER/13496–					
T1	19:13137	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002246	MF-408
DOE/ER/13567–					
T2	19:12760	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004485	MF-406
DOE/ER/13590–					
13	19:13838	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007605	MF-401
DOE/ER/13714–					
T2	19:13879	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007610	MF-401
DOE/ER/13774–					
4	19:12673	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006999	MF-401
DOE/ER/13832–					
36	19:12640	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008301	MF-404
DOE/ER/13869–					
5	19:13138	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007952	MF-408
DOE/ER/14003–					
3	19:11898	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005677	MF-401
DOE/ER/14053–					
T4	19:12706	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006631	MF-401
DOE/ER/14114–					
3	19:13139	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006987	MF-401
DOE/ER/14162–					
3	19:13911	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006985	MF-404
DOE/ER/14236–					
2	19:13834	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008067	MF-401
DOE/ER/14304–					
1	19:12599	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008588	MF-401
DOE/ER/14315–					
T1	19:12641	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008571	MF-404
DOE/ER/14317–					
T1	19:12777	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008501	MF-406
DOE/ER/14333–					
1	19:12674	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008352	MF-401

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/14340–					
1	19:12675	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008351	MF-410
DOE/ER/20022–					
T1	19:11899	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007449	MF-408
DOE/ER/20037–					
1	19:13195	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006505	MF-408
DOE/ER/20039–					
T1	19:13140	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008360	MF-408
DOE/ER/25145–					
T1	19:12778	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008261	MF-405
DOE/ER/40561–					
114	19:13880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007264	MF-413
118	19:13663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007268	MF-413
121	19:13672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007271	MF-414
DOE/ER/40606–					
3	19:13396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007168	MF-413
DOE/ER/40711–					
T1	19:13489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008388	MF-414
DOE/ER/40736–					
1	19:13586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006071	MF-414
DOE/ER/40757–					
020	19:13352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008303	MF-414
322	19:13490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008449	MF-414
DOE/ER/45197–					
8	19:13881	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008451	MF-414
DOE/ER/45287–					
1	19:12483	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007517	MF-404
2	19:12484	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007518	MF-404
3	19:12485	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007519	MF-404
6	19:12486	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007450	MF-404
DOE/ER/45372–					
6	19:13882	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008551	MF-404
DOE/ER/45415–					
T1	19:13830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008179	MF-410
DOE/ER/45482–					
1	19:12569	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008587	MF-404
DOE/ER/53207–					
10	19:14132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006504	MF-420
DOE/ER/53243–					
5	19:14133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008191	MF-420
DOE/ER/54137–					
T1	19:14134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008572	MF-420
DOE/ER/60407–					
T2	19:13155	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006027	MF-408
DOE/ER/60417–					
8	19:13228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003611	MF-408
DOE/ER/60434–					
8	19:13156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005678	MF-408; MF-401
DOE/ER/60507–					
7	19:13229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004163	MF-408
DOE/ER/60522–					
7	19:12935	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008503	MF-408
DOE/ER/60524–					
7	19:13230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002671	MF-408
DOE/ER/60533–					
6	19:13151	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003398	MF-408
DOE/ER/60621–					
T1	19:13141	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002595	MF-408
DOE/ER/60660–					
T1	19:13231	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008177	MF-408
DOE/ER/60985–					
3	19:13142	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007001	MF-408
DOE/ER/61127–					
3	19:13143	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007603	MF-410
DOE/ER/61221–					
2	19:13035	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008450	MF-402
DOE/ER/61487–					
2	19:13144	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008068	MF-408
DOE/ER/61490–					
1	19:13145	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007021	MF-408

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/61497–					
1	19:13150	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002769	MF-408
DOE/ER/61552–					
1	19:13036	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008265	MF-402
DOE/ER/61610–					
1	19:13157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006069	MF-408
DOE/ER/75666–					
1	19:12313	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008089	MF-400
DOE/ER/75711–					
1	19:13813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008349	MF-413
DOE/ET/53088–					
628	19:14135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007107	MF-420
631	19:13934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007108	MF-427
634	19:13935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007109	MF-421
635	19:12787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007110	MF-420
636	19:12835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007111	MF-420
637	19:13936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007112	MF-420
639	19:13937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007113	MF-420
646	19:14136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007114	MF-420
DOE/EW/50625–					
T14	19:13069	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007160	MF-902
DOE/FE–					
0287	19:11529	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007231	MF-101
0297P	19:11584	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008619	MF-131
94007444	19:12052	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007444	MF-105
DOE/FTR–					
94000733	19:13232	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000733	MF-407; MF-408
94000752	19:11798	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94000752	MF-400
94002461	19:12291	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002461	MF-500
94002463	19:12761	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002463	MF-410
94003539	19:12715	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003539	MF-706
94003547	19:12346	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003547	MF-231; MF-232
94003548	19:11900	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003548	MF-241
94003575	19:11953	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003575	MF-350
94003591	19:12936	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003591	MF-414
94003593	19:13587	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003593	MF-414
94004044	19:12762	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004044	MF-261
94004153	19:14137	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004153	MF-420
94004452	19:12444	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004452	MF-249
94004454	19:11872	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004454	MF-706
94004455	19:13938	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004455	MF-420
94004467	19:14138	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004467	MF-420
94004468	19:11980	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004468	MF-261
94004497	19:14243	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004497	MF-705
94004633	19:11421	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004633	MF-108
DOE/HR–					
0066	19:14212	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007232	MF-900
DOE/ID–					
10360(V2)	19:11940	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007505	MF-225
10430(AR)	19:11922	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007506	MF-225
10430(KS)	19:11923	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007507	MF-225
10430(LA)	19:11924	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007508	MF-225
10430(MO)	19:11925	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007509	MF-225
10430(MT)	19:11926	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007510	MF-225
10430(ND)	19:11927	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007511	MF-225
10430(OK)	19:11928	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007512	MF-225
10430(SD)	19:11929	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007513	MF-225
10430(TX)	19:11930	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007514	MF-225
10430(UT)	19:11931	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007515	MF-225
10430(WY)	19:11932	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007516	MF-225
10447	19:13324	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008792	MF-600
10500	19:13325	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008796	MF-600
DOE/ID/01570–					
T172	19:11551	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007767	MF-122
T173	19:11552	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007948	MF-122
DOE/ID/10412–					
6	19:11553	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005889	MF-251
7	19:11587	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005890	MF-251
8	19:11536	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005891	MF-251

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ID/12695–					
T1	19:12414	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008166	MF-310
DOE/ID/12735–					
T29	19:12351	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008176	MF-122
DOE/ID/12847–					
6	19:12487	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006738	PC-312
DOE/ID/12934–					
18	19:11957	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003570	MF-252
DOE/ID/13040–					
22	19:11955	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003290	MF-257
DOE/IG–					
0002/93	19:14213	OSTI (Free of Charge)		TI94003842	MF-960
0003	19:14214	OSTI (Free of Charge)		TI94004707	MF-960
0010/10	19:14215	OSTI (Free of Charge)		TI94003843	MF-960
0335	19:14216	OSTI (Free of Charge)		TI94003490	PC-960
0339	19:14217	OSTI (Free of Charge)		TI94007580	PC-960
0340	19:14218	OSTI (Free of Charge)		TI94007461	PC-960
DOE/LLW–					
193	19:11681	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008513	MF-940
DOE/MC/10637–					
3618	19:11502	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004059	MF-103; MF-105
DOE/MC/11076–					
3620	19:12415	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000089	PC-107
DOE/MC/22118–					
3546	19:11490	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000071	MF-107
DOE/MC/23167–					
3527	19:11516	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000052	MF-111
3636	19:11517	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004055	MF-111
DOE/MC/24021–					
3544	19:11422	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000069	PC-109
DOE/MC/24116–					
3632	19:11424	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004051	MF-109
94/C0282	19:11423	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007306	MF-109
DOE/MC/24132–					
3633	19:11518	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004052	MF-103
3635	19:11491	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004054	MF-103
DOE/MC/24257–					
3687	19:12053	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008635	MF-106
DOE/MC/25022–					
3619	19:12054	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000088	PC-106
DOE/MC/25105–					
94/C0302	19:11588	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007311	MF-132
DOE/MC/26024–					
94/C0290	19:11589	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007308	MF-132
DOE/MC/26308–					
3628	19:11982	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000097	MF-109
3637	19:11425	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004056	MF-109
3639	19:11426	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004060	MF-104
3640	19:11427	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004061	MF-104
3645	19:11983	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004063	MF-104
3647	19:11513	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004067	MF-104
3648	19:11984	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004068	MF-104
DOE/MC/26367–					
3622	19:11892	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000091	PC-108; PC-109
DOE/MC/27225–					
3625	19:11915	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000094	PC-108
3656	19:11916	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007385	MF-108
DOE/MC/27286–					
94/C0281	19:11599	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007305	MF-123
DOE/MC/27348–					
3631	19:11554	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000100	MF-122
DOE/MC/27391–					
94/C0283	19:11428	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007307	MF-109
DOE/MC/28060–					
94/C0276	19:12416	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006004	MF-107
DOE/MC/28130–					
94/C0296	19:11585	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007309	MF-132
DOE/MC/28182–					
94/C0303	19:12784	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007321	MF-132

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DOE/MC/28240–					
94/C0301	19:11590	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007310	MF-132
DOE/MC/29077–					
94/C0288	19:11591	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007318	MF-132
DOE/MC/29228–					
3670	19:11917	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004086	MF-113
DOE/MC/29237–					
3512	19:12355	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000042	MF-110
DOE/MC/29240–					
94/C0280	19:11602	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007304	MF-123
DOE/MC/29246–					
3616	19:11429	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004057	MF-106
DOE/MC/29444–					
3651	19:11985	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004069	MF-109
DOE/MC/29470–					
3668	19:11592	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004084	MF-106
DOE/MC/30070–					
94/C0289	19:11593	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007320	MF-132
DOE/MC/30097–					
3626	19:11413	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000095	MF-108; MF-109
3627	19:11986	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000096	MF-103; MF-106; MF-109
DOE/MC/30139–					
94/C0295	19:11586	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007319	MF-132
DOE/MC/30246–					
3617	19:11597	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004058	MF-111
DOE/METC/C–					
94/7120	19:11594	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007313	MF-132
DOE/MI/10270–					
T1	19:12298	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006983	MF-900
DOE/MT/92001–					
1	19:11576	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007807	MF-122
DOE/MT/92011–					
6	19:11575	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007806	MF-122
DOE/MT/92012–					
5	19:11582	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007805	MF-122
DOE/MT/93007–					
T1	19:11555	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007682	MF-122
DOE/NASA–					
0373-1	19:12450	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007379	MF-373
DOE/NBM–					
94000080	19:11600	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000080	MF-123
DOE/NV/10630–					
57	19:13070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007953	MF-705; MF-721
63	19:11799	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007960	MF-702
DOE/NV/10833–					
T2	19:11834	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007119	MF-702
DOE/NV/10845–					
23	19:11682	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007204	MF-703
27	19:13037	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003951	MF-702; MF-721
31	19:13071	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003950	MF-703; MF-705
37	19:11800	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006799	MF-702
DOE/NV/10872–					
T85	19:11683	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007769	MF-814
T91	19:11684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007777	MF-814
T92	19:13072	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007778	MF-814
T93	19:13073	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007779	MF-814
T98	19:11685	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007784	MF-814
DOE/NV/11432–					
10	19:13038	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004718	MF-702
40	19:11686	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008268	MF-721
DOE/OR–					
01-1192-D1	19:11687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007244	MF-902
DOE/OR/21981–					
T2	19:11835	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007047	MF-607
T3-Vol.1	19:11836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007048	MF-607

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
T3-Vol.2-Pt.A	19:11801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007049	MF-607
T3-Vol.2-Pt.B	19:11837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007050	MF-607
T3-Vol.2-Pt.C	19:11838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007051	MF-607
T3-Vol.2-Pt.D	19:11802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007052	MF-607
DOE/OR/22160–					
T5	19:13074	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007161	MF-902
DOE/PC/79997–					
1	19:11505	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005619	PC-113
DOE/PC/88801–					
T10	19:11435	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008146	MF-108
T11	19:11436	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008147	MF-108
T12	19:11437	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008148	MF-108
T13	19:11438	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008149	MF-108
T14	19:11439	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008150	MF-108
T15	19:11440	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008151	MF-108
T5	19:11430	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008141	MF-108
T6	19:11431	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008142	MF-108
T7	19:11432	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008143	MF-108
T8	19:11433	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008144	MF-108
T9	19:11434	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008145	MF-108
DOE/PC/89783–					
T10	19:11442	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008174	MF-108
T11	19:11443	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008175	MF-108
T9	19:11441	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008173	MF-108
DOE/PC/89883–					
77	19:11444	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008304	MF-108
DOE/PC/90545–					
T10	19:12033	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007993	MF-105
DOE/PC/91034–					
T6	19:11445	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008007	MF-108
DOE/PC/91047–					
T6	19:11479	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008371	MF-113
DOE/PC/91057–					
T6	19:11446	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008003	MF-108
DOE/PC/91281–					
T8	19:11447	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008005	MF-108
DOE/PC/91290–					
T8	19:11414	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008374	MF-102
DOE/PC/91295–					
T8	19:11492	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008376	MF-107
DOE/PC/91296–					
9	19:11480	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008305	MF-113
DOE/PC/91297–					
T4	19:11514	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008006	MF-117
DOE/PC/91299–					
13	19:11481	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008383	MF-102
DOE/PC/91303–					
T8	19:12676	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007998	MF-102
T9	19:11482	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008379	MF-102
DOE/PC/91308–					
9	19:11519	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007995	MF-104
DOE/PC/91311–					
T9	19:11448	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008378	MF-113
DOE/PC/91334–					
T145	19:11449	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006809	MF-109
DOE/PC/92108–					
T4	19:12677	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008385	MF-108
T5	19:11918	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008386	MF-108
DOE/PC/92111–					
T4	19:11595	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008384	MF-125
DOE/PC/92117–					
T6	19:11919	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008330	MF-108
DOE/PC/92119–					
T2	19:11493	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007997	MF-108
DOE/PC/92120–					
T1	19:11450	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008088	MF-108
DOE/PC/92159–					
T3	19:11520	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008008	MF-113
DOE/PC/92162–					
T3	19:11521	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008324	MF-113

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DOE/PC/92207–					
T4-Vol.1	19:11415	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005683	PC-102
DOE/PC/92521–					
T118	19:11460	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008412	MF-102; MF-105
T119	19:11461	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008413	MF-105
T120	19:11462	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008414	MF-105
T67	19:11483	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008009	MF-102
T68	19:11484	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008010	MF-115
T69	19:11522	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008011	MF-105; MF-109
T70	19:11523	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008012	MF-102
T71	19:11466	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008013	MF-113
T72	19:11524	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008014	MF-104; MF-107
T73	19:11525	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008015	MF-105
T74	19:11494	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008016	MF-104; MF-107
T75	19:11495	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008017	MF-107
T76	19:11467	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008018	MF-107
T77	19:11496	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008019	MF-102; MF-105
T78	19:11451	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008020	MF-105; MF-102
T79	19:11485	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008021	MF-105
T80	19:11486	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008022	MF-105
T81	19:11452	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008023	MF-105
T82	19:11453	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008024	MF-105
T83	19:11454	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008025	MF-105
T84	19:11455	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008026	MF-105
T85	19:11468	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008027	MF-105
T86	19:11456	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008028	MF-109
T87	19:11469	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008029	MF-105
T88	19:11470	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008030	MF-105
T89	19:11457	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008031	MF-105
T90	19:11458	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008032	MF-105
T91	19:11487	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008033	MF-105
T92	19:11416	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008034	MF-105
T93	19:11459	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008035	MF-105
T94	19:11497	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008036	MF-105
T95	19:11498	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008037	MF-105
T96	19:11471	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008038	MF-105
T97	19:11499	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008039	MF-105
T98	19:11500	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008040	MF-105
DOE/PC/92530–					
T5	19:11526	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007496	MF-103
DOE/PC/92534–					
6	19:12100	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008321	MF-105
DOE/PC/92535–					
T5	19:12101	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008329	MF-104
DOE/PC/92536–					
T4	19:12678	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008326	MF-102
DOE/PC/92539–					
5	19:12707	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008382	MF-103
DOE/PC/92542–					
T4	19:12488	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008004	MF-114
DOE/PC/92544–					
6	19:11488	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008322	MF-113
DOE/PC/92546–					
T5	19:11489	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008325	MF-102
DOE/PC/92548–					
T5	19:12102	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008331	MF-105
DOE/PC/93203–					
T1	19:11417	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008178	MF-102
DOE/PC/93214–					
T1	19:12103	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008086	MF-105
DOE/RL–					
90-04-Rev.2	19:11688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007423	MF-630
92-76	19:11839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007154	MF-630
93-0047	19:11804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007422	MF-630
93-104	19:11691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007983	MF-902

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93-21-Vol.2	19:11840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008646	MF-903
93-23	19:11803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007158	MF-903
93-38	19:11841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007992	MF-900
93-38-Exec.Summ.	19:11842	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004713	MF-900
93-56-3	19:11805	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007424	MF-902
93-69	19:14277	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004893	MF-900
93-76	19:11689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007991	MF-902
93-94	19:11690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006997	MF-903
DOE/RW/00134–					
T8	19:11692	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008425	MF-800
DOE/S–					
0107	19:12332	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007234	MF-900
DOE/SF/15798–					
T10	19:11967	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007010	MF-257
T11	19:11962	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007011	MF-257
T12	19:11968	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007012	MF-257
T5	19:11960	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007005	MF-257
T6	19:11964	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007006	MF-257
T7	19:11965	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007007	MF-257
T8	19:11961	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007008	MF-257
T9	19:11966	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007009	MF-257
DOE/SF/18862–					
T2	19:14139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006209	MF-712
DOE/SF/19645–					
T3	19:12489	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008341	MF-504
DOE/SR/15199–					
6	19:12299	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005337	MF-703
DOE/SWPA–					
9401	19:12343	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007581	PC-900
DOE/UMTRA–					
3050-93-1235-Vol.1	19:11693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007205	MF-902
3050-93-1235-Vol.2	19:11694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007206	MF-902
DOE/WIPP–					
93-017	19:11695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007447	MF-940
93-022	19:13075	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008049	MF-703
94-008	19:11696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007975	MF-902
94-009	19:11697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008042	MF-940
DPhT–					
91-64.	19:13670	*See* CEA-CONF–11443			
DRC-TH–					
05/93.	19:13451	*See* IFT-P–051/93			
DUN–					
1728	19:12200	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007881	MF-701
5298-RD	19:12260	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007830	MF-700
5538-RD	19:12261	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007873	MF-603
ECN-RX–					
93-035	19:11698	OSTI; NTIS		DE94747265	
EDF–					
93-NB-00088	19:12127	OSTI; NTIS (US Sales Only); INIS		DE94613809	
EEG–					
54	19:11671	*See* DOE/AL/58309–54			
EGG–					
11265-2029	19:13076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006476	MF-702
11265-5013	19:13001	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006479	MF-700
2686	19:12274	*See* NUREG/CR–5935			
2700/92	19:13158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003659	MF-408
2719	19:11723	*See* NUREG/CR–6138			
EGG-EP–					
10948	19:12452	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008514	MF-333
10999	19:12453	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008515	MF-331
EGG-NPR–					
10795	19:12201	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008518	MF-1030
EGG-RAAM–					
10980	19:12344	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008525	MF-220
EGG-SCM–					
10713	19:12570	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008517	MF-504
10804	19:12600	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008519	MF-404
EGG-WTD–					
10784-Vol.1	19:11843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008589	MF-940
10784-Vol.2	19:11844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008590	MF-940

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10784-Vol.3	19:11845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008591	MF-940
10895	19:12716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002847	MF-902
EML–					
558	19:12990	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007463	MF-402
ENEA-RT-AMB–					
93-13	19:13077	OSTI; NTIS (US Sales Only)		DE94752552	
ENEA-RT-ERG-FUS–					
93-02	19:13939	OSTI; NTIS (US Sales Only)		DE94752536	
93-08	19:14140	OSTI; NTIS (US Sales Only)		DE94752535	
ENEA-RT-INN–					
92-20	19:12788	OSTI; NTIS (US Sales Only)		DE94716575	
92-40	19:12601	OSTI; NTIS (US Sales Only)		DE94716511	
93-10	19:12790	OSTI; NTIS (US Sales Only)		DE94752518	
93-16	19:14244	OSTI; NTIS (US Sales Only)		DE94752545	
93-32	19:13192	OSTI; NTIS (US Sales Only)		DE94752546	
ENEA-RT-NUCL–					
92-24	19:14141	OSTI; NTIS (US Sales Only)		DE94002065	
ERA-NRE–					
94-008	19:12171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008432	MF-520
ES/CSET–					
19	19:11873	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007917	MF-407
ES/ER/TM–					
101	19:12717	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007919	MF-902
96	19:13122	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006320	MF-902
ESI–					
1993.	19:13373	*See* UWThPh–1993-16			
ESTSC–					
000428D078001	19:14245	ESTSC; Los Alamos National Laboratory			
000587IBMPC01	19:14246	ESTSC			
000610D0VAX00	19:14247	ESTSC			
ETDE-IT–					
94-08	19:12202	OSTI; NTIS (US Sales Only)		DE94752490	
94-09	19:14158	OSTI; NTIS (US Sales Only)		DE94752510	
94-10	19:12718	OSTI; NTIS (US Sales Only)		DE94752511	
94-11	19:12602	OSTI; NTIS (US Sales Only)		DE94752512	
94-12	19:14159	OSTI; NTIS (US Sales Only)		DE94752513	
94-13	19:12119	OSTI; NTIS (US Sales Only)		DE94752514	
94-14	19:13940	OSTI; NTIS (US Sales Only)		DE94752515	
94-15	19:12490	OSTI; NTIS (US Sales Only)		DE94752516	
94-16	19:12603	OSTI; NTIS (US Sales Only)		DE94752517	
94-17	19:13941	OSTI; NTIS (US Sales Only)		DE94752519	
94-18	19:12791	OSTI; NTIS (US Sales Only)		DE94752520	
94-19	19:13942	OSTI; NTIS (US Sales Only)		DE94752521	
94-20	19:12571	OSTI; NTIS (US Sales Only)		DE94752539	
94-21	19:13233	OSTI; NTIS (US Sales Only)		DE94752540	
94-22	19:13317	OSTI; NTIS (US Sales Only)		DE94752541	
94-23	19:13943	OSTI; NTIS (US Sales Only)		DE94752542	
94-24	19:12719	OSTI; NTIS (US Sales Only)		DE94752543	
94-25	19:11699	OSTI; NTIS (US Sales Only)		DE94752544	
94-26	19:13159	OSTI; NTIS (US Sales Only)		DE94752547	
94-27	19:12491	OSTI; NTIS (US Sales Only)		DE94752548	
94-28	19:13944	OSTI; NTIS (US Sales Only)		DE94752549	
94-29	19:12792	OSTI; NTIS (US Sales Only)		DE94752550	
94-30	19:14160	OSTI; NTIS (US Sales Only)		DE94752551	
94-31	19:13839	OSTI; NTIS (US Sales Only)		DE94752568	
94-32	19:12314	OSTI; NTIS (US Sales Only); INIS		DE94752591	
94-33	19:11914	OSTI; NTIS (US Sales Only); INIS		DE94752633	
94-34	19:13234	OSTI; NTIS (US Sales Only)		DE94752597	
94-35	19:12492	OSTI; NTIS (US Sales Only)		DE94752604	
94-36	19:13078	OSTI; NTIS (US Sales Only); INIS		DE94752605	
94-37	19:12417	OSTI; NTIS (US Sales Only)		DE94752606	
94-38	19:12397	OSTI; NTIS (US Sales Only)		DE94752621	
94-39	19:12398	OSTI; NTIS (US Sales Only)		DE94752622	
94-40	19:13318	OSTI; NTIS (US Sales Only)		DE94752623	
94-41	19:13196	OSTI; NTIS (US Sales Only)		DE94752624	
EUR–					
13541	19:12418	OSTI; NTIS (US Sales Only)		TI94749205	
13647	19:12785	OSTI; NTIS (US Sales Only)		TI94749206	
14454	19:12262	OSTI; NTIS (US Sales Only); INIS		TI94613816	
14659	19:11605	OSTI; NTIS (US Sales Only); INIS		TI94617775	
15004	19:13080	OSTI; NTIS (US Sales Only); INIS		TI94617766	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
15154	19:11603	OSTI; NTIS (US Sales Only); INIS		TI94614337	
EUR-CEA-FC–					
1475	19:13945	OSTI; NTIS (US Sales Only); INIS		TI94617214	
1482	19:13946	OSTI; NTIS (US Sales Only); INIS		TI94617176	
FEI–					
2098	19:12153	OSTI; NTIS (US Sales Only); INIS		DE94616343	
2197	19:12154	OSTI; NTIS (US Sales Only); INIS		DE94616344	
2212	19:12155	OSTI; NTIS (US Sales Only); INIS		DE94616345	
2227	19:13947	OSTI; NTIS (US Sales Only); INIS		DE94617229	
2252	19:13758	OSTI; NTIS (US Sales Only); INIS		DE94617008	
2253	19:13759	OSTI; NTIS (US Sales Only); INIS		DE94617009	
FEMP–					
2291	19:11846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006524	MF-702; MF-707
2315	19:12720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007081	MF-706
FEMP/SUB–					
068	19:11700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005364	MF-903
FNAL-TM–					
1825	19:12853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007272	MF-414
1868	19:12940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008220	MF-414
1875	19:12941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007390	MF-414
FNAL/C–					
92/261	19:13647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008269	MF-414
93/174	19:12837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007397	MF-414
93/175	19:12838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007396	MF-414
93/177	19:12839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007399	MF-414
93/207-E	19:13588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006847	MF-414
93/210-E	19:13589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006846	MF-414
93/359-E	19:13590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007392	MF-414
93/362-E	19:13591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006848	MF-414
93/388-E	19:13592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006849	MF-414
93/403-E	19:13593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008222	MF-414
93/404-E	19:13491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008270	MF-414
94/006-E	19:13648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008223	MF-414
94/014-E	19:13649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007394	MF-414
94/016-E	19:13594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006951	MF-414
94/017-E	19:13595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006952	MF-414
94/018	19:12937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007391	MF-414
94/019	19:12840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007393	MF-414
94/020	19:12841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007402	MF-414
94/021-E	19:13650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007398	MF-414
94/023-E	19:12938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006953	MF-414
94/030-E	19:12939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007401	MF-414
94/031	19:13651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008224	MF-414
94/035-E	19:13596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008271	MF-414
94/036-E	19:13652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007400	MF-414
FOA-C–					
40306-4.3	19:13235	OSTI; NTIS; INIS		DE94615974	
FRCEA-TH–					
379	19:13160	OSTI; NTIS (US Sales Only); INIS		DE94617962	
FUB-HEP–					
6/93	19:13440	*See* DESY–93-025			
FZR–					
92-15	19:14219	OSTI; NTIS (US Sales Only); INIS		DE94745993	
93-04	19:12696	OSTI; NTIS (US Sales Only); INIS		DE94752365	
93-07(prepr.)	19:13492	OSTI; NTIS (US Sales Only); INIS		DE94752392	
GA-A–					
21487	19:14161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004858	MF-420
21517	19:14162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007374	MF-420
21518	19:13948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007371	MF-426
21520	19:13949	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007430	MF-420
21525	19:13950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007373	MF-426
21541	19:13951	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007428	MF-420
21554	19:13952	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007429	MF-420
GANIL-P–					
93-01	19:13673	OSTI; NTIS (US Sales Only); INIS		DE94618612	
93-07	19:13493	OSTI; NTIS (US Sales Only); INIS		DE94618514	
93-08	19:13674	OSTI; NTIS (US Sales Only); INIS		DE94618589	
93-10	19:13675	OSTI; NTIS (US Sales Only); INIS		DE94618590	
93-11	19:12942	OSTI; NTIS (US Sales Only); INIS		DE94618209	
93-12	19:13760	OSTI; NTIS (US Sales Only); INIS		DE94618687	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
GANIL-P–					
93-13	19:13353	OSTI; NTIS (US Sales Only); INIS		DE94618360	
93-14	19:13761	OSTI; NTIS (US Sales Only); INIS		DE94618688	
93-15	19:13397	OSTI; NTIS (US Sales Only); INIS		DE94618436	
93-16	19:13762	OSTI; NTIS (US Sales Only); INIS		DE94618689	
GANIL-R–					
93-07	19:12943	OSTI; NTIS (US Sales Only); INIS		DE94618220	
GRS-F–					
1/1992	19:12263	OSTI; NTIS (US Sales Only); INIS		DE94747614	
GSF–					
6/93	19:13081	OSTI; NTIS (US Sales Only)		DE94752448	
B/93	19:13236	OSTI; NTIS (US Sales Only); INIS		DE94752447	
GSI–					
93-20	19:13676	OSTI; NTIS (US Sales Only); INIS		DE94747630	
93-22(prepr.)	19:13763	OSTI; NTIS (US Sales Only); INIS		DE94752372	
93-24(prepr.)	19:13764	OSTI; NTIS (US Sales Only); INIS		DE94752373	
93-25(prepr.)	19:13765	OSTI; NTIS (US Sales Only); INIS		DE94752371	
93-26(prepr.)	19:13677	OSTI; NTIS (US Sales Only); INIS		DE94752363	
93-27	19:13840	OSTI; NTIS (US Sales Only); INIS		DE94747631	
93-27(prepr.)	19:13678	OSTI; NTIS (US Sales Only); INIS		DE94752362	
93-28(prepr.)	19:13679	OSTI; NTIS (US Sales Only); INIS		DE94752361	
93-29(prepr.)	19:13766	OSTI; NTIS (US Sales Only); INIS		DE94752359	
93-31(prepr.)	19:13354	OSTI; NTIS (US Sales Only); INIS		DE94752360	
93-33	19:13767	OSTI; NTIS (US Sales Only); INIS		DE94747605	
93-50(prepr.)	19:13161	OSTI; NTIS (US Sales Only); INIS		DE94752456	
93-52(prepr.)	19:13768	OSTI; NTIS (US Sales Only); INIS		DE94752449	
93-71(prepr.)	19:13769	OSTI; NTIS (US Sales Only); INIS		DE94747486	
93-74(prepr.)	19:13770	OSTI; NTIS (US Sales Only); INIS		DE94751878	
HAN–					
63570	19:11619	*See* HW–42978			
89378	19:13123	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007879	MF-603
96016	19:12200	*See* DUN–1728			
HD-THEP–					
93-28	19:13445	*See* DESY–93-094			
93-36	19:13446	*See* DESY–93-128			
HEP-LAT–					
9309018	19:13448	*See* DESY–93-134			
HEP-PH–					
9310212	19:13576	*See* DESY–93-090			
HEP-TH–					
9307031	19:13429	*See* BONN-HE–93-05			
HLRZ–					
93-12	19:13440	*See* DESY–93-025			
HMI-B–					
508	19:13680	OSTI; NTIS (US Sales Only); INIS		DE94747575	
HU-Berlin-IEP–					
93/4	19:13449	*See* DESY–93-136			
HW–					
13292	19:12207	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006679	MF-711
19906	19:12190	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006700	MF-520
21404	19:12208	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006709	MF-504
21413	19:12209	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006708	MF-504
21461	19:12210	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006707	MF-504
21560	19:12211	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006706	MF-504
21659	19:12212	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007326	MF-500
22201-Del.	19:12213	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007810	MF-700
24055	19:12214	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006702	MF-520
24429	19:12215	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006705	MF-520
27555	19:12216	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006713	MF-520
27796	19:11610	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006712	MF-711
28295	19:12721	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006972	MF-711
3-1766	19:12203	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006960	MF-520
3-2593	19:12204	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006704	MF-520
3-2638	19:12205	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006079	MF-520
3-3046	19:12206	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006703	MF-520
31864	19:11611	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006973	MF-711
32726-RD	19:11606	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006974	MF-520
33048	19:11612	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006715	MF-711
33099	19:11613	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006975	MF-711
34196	19:12217	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006684	MF-520
34821	19:12191	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006690	MF-707
35055	19:11614	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94005917	MF-711

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
36371-RD	19:11615	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006686	MF-711
37137-RD	19:12218	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006976	MF-711
37228	19:11616	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006977	MF-711
38308	19:11701	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006959	MF-520
38881	19:11617	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006682	MF-711
39872	19:11618	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006699	MF-711
42978	19:11619	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006685	MF-711
50081	19:11607	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007750	MF-501
55261	19:12219	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006978	MF-711
55590	19:11620	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006073	MF-500
56523	19:12220	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006683	MF-520
59717	19:12320	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006310	MF-500
61082	19:13237	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007886	MF-702
61565-RD	19:12697	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94003754	MF-510
66916	19:11621	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006698	MF-520
67313	19:11702	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006693	MF-510
68377	19:12221	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006687	MF-520
69561	19:11847	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007887	MF-603
71619-RD-Rev.1	19:12264	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007889	MF-603
75958-RD	19:13124	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007890	MF-603
77942	19:11622	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007893	MF-603
78741	19:12265	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007894	MF-711
79305	19:12222	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006718	MF-711
79468	19:11623	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007895	MF-700
79650	19:12223	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006717	MF-711
79944	19:11848	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007896	MF-603
80937	19:12266	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007897	MF-603
81295-12	19:11703	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007898	MF-603
89073	19:12192	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006980	MF-600
IAEA-SM–					
33/124	19:11871	*See* BNL–49978			
333/111	19:12469	*See* LA-UR–94-0256			
333/120	19:11877	*See* K/NSP–165			
333/126	19:12467	*See* LA-UR–94-154			
333/94	19:12468	*See* LA-UR–94-164			
IAEA-TECDOC–					
715	19:14220	OSTI; NTIS (US Sales Only); INIS		DE94616606	
718	19:13238	OSTI; NTIS (US Sales Only); INIS		DE94615975	
722	19:12144	OSTI; NTIS (US Sales Only); INIS		DE94616330	
724	19:12115	OSTI; NTIS (US Sales Only); INIS		DE94616280	
726	19:13082	OSTI; NTIS (US Sales Only); INIS		DE94615824	
727	19:12315	OSTI; NTIS (US Sales Only); INIS		DE94616012	
729	19:12116	OSTI; NTIS (US Sales Only); INIS		DE94616281	
ICSP–					
AS-SPR-R	19:12277	*See* NUREG/IA–0121			
IFSR–					
628	19:14135	*See* DOE/ET/53088–628			
631	19:13934	*See* DOE/ET/53088–631			
634	19:13935	*See* DOE/ET/53088–634			
635	19:12787	*See* DOE/ET/53088–635			
636	19:12835	*See* DOE/ET/53088–636			
637	19:13936	*See* DOE/ET/53088–637			
639	19:13937	*See* DOE/ET/53088–639			
646	19:14136	*See* DOE/ET/53088–646			
IFT-P–					
051/93	19:13451	OSTI; NTIS (US Sales Only); INIS		DE94616649	
056-93	19:13494	OSTI; NTIS (US Sales Only); INIS		DE94618519	
059-93	19:13495	OSTI; NTIS (US Sales Only); INIS		DE94616775	
060-93	19:13452	OSTI; NTIS (US Sales Only); INIS		DE94616650	
063-93	19:13453	OSTI; NTIS (US Sales Only); INIS		DE94618450	
064-93	19:13454	OSTI; NTIS (US Sales Only); INIS		DE94616651	
066-93	19:13496	OSTI; NTIS (US Sales Only); INIS		DE94616852	
068-93	19:13455	OSTI; NTIS (US Sales Only); INIS		DE94616652	
069-93	19:13456	OSTI; NTIS (US Sales Only); INIS		DE94616653	
070-93	19:13457	OSTI; NTIS (US Sales Only); INIS		DE94616654	
IFUSP-P–					
1074.	19:13452	*See* IFT-P–060-93			
1075.	19:13495	*See* IFT-P–059-93			
IFVE-OTF–					
91-13.	19:13458	*See* IHEP-OTF–91-13			

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IHEP-OTF–					
91-13	19:13458	OSTI; NTIS (US Sales Only); INIS		DE94618465	
92-143	19:13459	OSTI; NTIS (US Sales Only); INIS		DE94618485	
92-146	19:13460	OSTI; NTIS (US Sales Only); INIS		DE94618486	
IHEP-TD–					
91-8	19:13355	OSTI; NTIS (US Sales Only); INIS		DE94618361	
INFO–					
0424	19:13261	OSTI; NTIS (US Sales Only); INIS		DE94613218	
INIS-BR–					
3238	19:13125	OSTI; NTIS (US Sales Only); INIS		DE94615844	
3239	19:13040	OSTI; NTIS (US Sales Only); INIS		DE94615861	
3246	19:13206	OSTI; NTIS (US Sales Only); INIS		DE94615912	
3247	19:13207	OSTI; NTIS (US Sales Only); INIS		DE94615913	
3248	19:13208	OSTI; NTIS (US Sales Only); INIS		DE94617870	
3249	19:13209	OSTI; NTIS (US Sales Only); INIS		DE94617871	
3250	19:13893	OSTI; NTIS (US Sales Only); INIS		DE94618825	
3251	19:13771	OSTI; NTIS (US Sales Only); INIS		DE94618656	
3252	19:12944	OSTI; NTIS (US Sales Only); INIS		DE94618221	
3253	19:12945	OSTI; NTIS (US Sales Only); INIS		DE94618201	
3254	19:13953	OSTI; NTIS (US Sales Only); INIS		DE94618761	
3255	19:13461	OSTI; NTIS (US Sales Only); INIS		DE94618451	
3256	19:13903	OSTI; NTIS (US Sales Only); INIS		DE94618848	
3257	19:13868	OSTI; NTIS (US Sales Only); INIS		DE94618756	
3258	19:13497	OSTI; NTIS (US Sales Only); INIS		DE94618502	
3259	19:13702	OSTI; NTIS (US Sales Only); INIS		DE94618640	
3260	19:11608	OSTI; NTIS (US Sales Only); INIS		DE94617489	
3261	19:13841	OSTI; NTIS (US Sales Only); INIS		DE94618731	
3262	19:13399	OSTI; NTIS (US Sales Only); INIS		DE94618437	
3263	19:13162	OSTI; NTIS (US Sales Only); INIS		DE94617963	
3264	19:12172	OSTI; NTIS (US Sales Only); INIS		DE94619557	
3265	19:12173	OSTI; NTIS (US Sales Only); INIS		DE94618123	
3266	19:13262	OSTI; NTIS (US Sales Only); INIS		DE94617892	
3267	19:13400	OSTI; NTIS (US Sales Only); INIS		DE94618438	
3268	19:12493	OSTI; NTIS (US Sales Only); INIS		DE94617507	
3281	19:12642	OSTI; NTIS (US Sales Only); INIS		DE94620258	
3282	19:13126	OSTI; NTIS (US Sales Only); INIS		DE94620606	
3283	19:12692	OSTI; NTIS (US Sales Only); INIS		DE94620394	
3284	19:13210	OSTI; NTIS (US Sales Only); INIS		DE94620772	
INIS-GB–					
522	19:14221	OSTI; NTIS (US Sales Only); INIS		DE94618345	
558	19:14222	OSTI; NTIS (US Sales Only); INIS		DE94616607	
559	19:12193	OSTI; NTIS (US Sales Only); INIS		DE94615965	
583	19:13263	OSTI; NTIS (US Sales Only); INIS		DE94619345	
585	19:13264	OSTI; NTIS (US Sales Only); INIS		DE94619347	
586	19:13265	OSTI; NTIS (US Sales Only); INIS		DE94620887	
587	19:13266	OSTI; NTIS (US Sales Only); INIS		DE94620888	
588	19:13267	OSTI; NTIS (US Sales Only); INIS		DE94620889	
589	19:13268	OSTI; NTIS (US Sales Only); INIS		DE94619247	
591	19:11806	OSTI; NTIS (US Sales Only); INIS		DE94619321	
592	19:11807	OSTI; NTIS (US Sales Only); INIS		DE94619322	
605	19:12145	OSTI; NTIS (US Sales Only); INIS		DE94621296	
INIS-JP–					
016	19:12267	OSTI; NTIS; INIS		DE94748658	
017	19:13954	OSTI; NTIS; INIS		DE94748680	
INIS-RU–					
349	19:12503	OSTI; NTIS (US Sales Only); INIS		DE94615464	
351	19:12504	OSTI; NTIS (US Sales Only); INIS		DE94617566	
361	19:13905	OSTI; NTIS (US Sales Only); INIS		DE94615768	
362	19:13425	OSTI; NTIS (US Sales Only); INIS		DE94616200	
363	19:13426	OSTI; NTIS (US Sales Only); INIS		DE94616167	
370	19:14181	OSTI; NTIS (US Sales Only); INIS		DE94617517	
371	19:12514	OSTI; NTIS (US Sales Only); INIS		DE94617508	
372	19:12117	OSTI; NTIS (US Sales Only); INIS		DE94616109	
373	19:12913	OSTI; NTIS (US Sales Only); INIS		DE94616233	
INIS-XN–					
477	19:11881	OSTI; NTIS (US Sales Only); INIS		DE94618332	
478	19:11874	OSTI; NTIS (US Sales Only); INIS		DE94618338	
479	19:14284	OSTI; NTIS (US Sales Only); INIS		DE94618327	
INIS-mf–					
13749	19:13842	OSTI; NTIS (US Sales Only); INIS		DE94617409	
13751	19:12174	OSTI; NTIS (US Sales Only); INIS		DE94616247	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
13753	19:12224	OSTI; NTIS (US Sales Only); INIS		DE94616353	
13754	19:12474	OSTI; NTIS (US Sales Only); INIS		DE94615443	
13755	19:12149	OSTI; NTIS (US Sales Only); INIS		DE94616342	
13760	19:13956	OSTI; NTIS (US Sales Only); INIS		DE94617115	
13775	19:13270	OSTI; NTIS (US Sales Only); INIS		DE94615903	
13779	19:13965	OSTI; NTIS (US Sales Only); INIS		DE94621827	
13780	19:13342	OSTI; NTIS (US Sales Only); INIS		DE94617985	
13782	19:13095	OSTI; NTIS (US Sales Only); INIS		DE94617767	
13783	19:12163	OSTI; NTIS (US Sales Only); INIS		DE94616597	
13784	19:12183	OSTI; NTIS (US Sales Only); INIS		DE94618139	
13787	19:13271	OSTI; NTIS (US Sales Only); INIS		DE94617893	
13788	19:13096	OSTI; NTIS (US Sales Only); INIS		DE94617768	
13789	19:12184	OSTI; NTIS (US Sales Only); INIS		DE94618140	
13791	19:12948	OSTI; NTIS (US Sales Only); INIS		DE94616485	
13792	19:11886	OSTI; NTIS (US Sales Only); INIS		DE94619488	
13794	19:12498	OSTI; NTIS (US Sales Only); INIS		DE94615484	
13795	19:12499	OSTI; NTIS (US Sales Only); INIS		DE94617534	
13796	19:11887	OSTI; NTIS (US Sales Only); INIS		DE94616092	
13797	19:13127	OSTI; NTIS (US Sales Only); INIS		DE94617787	
13800	19:11883	OSTI; NTIS (US Sales Only); INIS		DE94616078	
13810	19:14002	OSTI; NTIS (US Sales Only); INIS		DE94620118	
13812	19:12461	OSTI; NTIS (US Sales Only); INIS		DE94618335	
13813	19:12462	OSTI; NTIS (US Sales Only); INIS		DE94618336	
13814	19:12463	OSTI; NTIS (US Sales Only); INIS		DE94618337	
13820	19:13211	OSTI; NTIS (US Sales Only); INIS		DE94620773	
13821	19:13212	OSTI; NTIS (US Sales Only); INIS		DE94619300	
13822	19:13272	OSTI; NTIS (US Sales Only); INIS		DE94617894	
13823	19:12194	OSTI; NTIS (US Sales Only); INIS		DE94619320	
13824	19:13273	OSTI; NTIS (US Sales Only); INIS		DE94617853	
13825	19:13274	OSTI; NTIS (US Sales Only); INIS		DE94617895	
13826	19:13275	OSTI; NTIS (US Sales Only); INIS		DE94617881	
13827	19:11880	OSTI; NTIS (US Sales Only); INIS		DE94618331	
13828	19:13276	OSTI; NTIS (US Sales Only); INIS		DE94617896	
13829	19:12195	OSTI; NTIS (US Sales Only); INIS		DE94617878	
13830	19:13277	OSTI; NTIS (US Sales Only); INIS		DE94617854	
13831	19:13278	OSTI; NTIS (US Sales Only); INIS		DE94617897	
13832	19:13279	OSTI; NTIS (US Sales Only); INIS		DE94617855	
13833	19:13280	OSTI; NTIS (US Sales Only); INIS		DE94617856	
13834	19:13281	OSTI; NTIS (US Sales Only); INIS		DE94617857	
13852	19:13213	OSTI; NTIS (US Sales Only); INIS		DE94620779	
14132	19:12500	OSTI; NTIS (US Sales Only); INIS		DE94752428	
14136	19:12501	OSTI; NTIS (US Sales Only); INIS		DE94752432	
14141	19:12649	OSTI; NTIS (US Sales Only); INIS		DE94747621	
14142	19:12650	OSTI; NTIS (US Sales Only); INIS		DE94747620	
14143	19:12651	OSTI; NTIS (US Sales Only); INIS		DE94747619	
14149	19:12130	OSTI; NTIS (US Sales Only); INIS		DE94747246	
14163	19:12771	OSTI; NTIS (US Sales Only); INIS		DE94745991	
14176	19:12321	OSTI; NTIS (US Sales Only); INIS		DE94747576	
14177	19:13895	OSTI; NTIS (US Sales Only); INIS		DE94752433	
14178	19:12576	OSTI; NTIS (US Sales Only); INIS		DE94747622	
14179	19:12502	OSTI; NTIS (US Sales Only); INIS		DE94752435	
14180	19:13912	OSTI; NTIS (US Sales Only); INIS		DE94747578	
14181	19:12577	OSTI; NTIS (US Sales Only); INIS		DE94747579	
14182	19:12823	OSTI; NTIS (US Sales Only); INIS		DE94747245	
14185	19:12609	OSTI; NTIS (US Sales Only); INIS		DE94752191	
INP–					
1505/C	19:12698	OSTI; NTIS (US Sales Only); INIS		DE94615380	
1577/PH	19:13358	OSTI; NTIS (US Sales Only); INIS		DE94616615	
1578/PH	19:13359	OSTI; NTIS (US Sales Only); INIS		DE94616616	
1579/PH	19:13360	OSTI; NTIS (US Sales Only); INIS		DE94616617	
1582/PL	19:13681	OSTI; NTIS (US Sales Only); INIS		DE94616967	
1596/PH	19:13599	OSTI; NTIS (US Sales Only); INIS		DE94616886	
1599/PL	19:13775	OSTI; NTIS (US Sales Only); INIS		DE94617031	
1608/PH	19:13600	OSTI; NTIS (US Sales Only); INIS		DE94616870	
1610/C	19:12699	OSTI; NTIS (US Sales Only); INIS		DE94615381	
91-27	19:13385	OSTI; NTIS (US Sales Only); INIS		DE94618411	
91-45	19:13835	OSTI; NTIS (US Sales Only); INIS		DE94617056	
91-80	19:13500	OSTI; NTIS (US Sales Only); INIS		DE94618495	
INP-MSU–					
92-41-290	19:13654	OSTI; NTIS (US Sales Only); INIS		DE94618570	
93-3-295	19:13411	OSTI; NTIS (US Sales Only); INIS		DE94615858	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
INPE–					
4621	19:14048	OSTI; NTIS (US Sales Only); INIS		DE94618778	
INS–					
1014	19:13874	OSTI; NTIS; INIS		DE94748668	
993	19:12854	OSTI; NTIS; INIS		DE94748500	
994	19:12855	OSTI; NTIS; INIS		DE94748501	
995	19:12856	OSTI; NTIS; INIS		DE94748502	
IPEN-PUB–					
381	19:12693	OSTI; NTIS (US Sales Only); INIS		DE94615424	
387	19:13282	OSTI; NTIS (US Sales Only); INIS		DE94615904	
389	19:12578	OSTI; NTIS (US Sales Only); INIS		DE94615585	
390	19:12700	OSTI; NTIS (US Sales Only); INIS		DE94615382	
391	19:12227	OSTI; NTIS (US Sales Only); INIS		DE94616354	
392	19:12652	OSTI; NTIS (US Sales Only); INIS		DE94615287	
IPNO-DRE–					
92-11	19:12679	OSTI; NTIS (US Sales Only); INIS		DE94617434	
92-12	19:12653	OSTI; NTIS (US Sales Only); INIS		DE94617431	
93-01	19:13776	OSTI; NTIS (US Sales Only); INIS		DE94618690	
93-02	19:13777	OSTI; NTIS (US Sales Only); INIS		DE94618676	
93-03	19:13703	OSTI; NTIS (US Sales Only); INIS		DE94618641	
93-04	19:12950	OSTI; NTIS (US Sales Only); INIS		DE94618222	
93-06	19:13778	OSTI; NTIS (US Sales Only); INIS		DE94618691	
93-07	19:13704	OSTI; NTIS (US Sales Only); INIS		DE94618642	
93-08	19:13705	OSTI; NTIS (US Sales Only); INIS		DE94618643	
93-09	19:13601	OSTI; NTIS (US Sales Only); INIS		DE94618535	
93-10	19:13706	OSTI; NTIS (US Sales Only); INIS		DE94618644	
93-11	19:12951	OSTI; NTIS (US Sales Only); INIS		DE94618210	
93-12	19:13779	OSTI; NTIS (US Sales Only); INIS		DE94618692	
93-13	19:13780	OSTI; NTIS (US Sales Only); INIS		DE94618693	
IPNO-TH–					
92-101	19:13362	OSTI; NTIS (US Sales Only); INIS		DE94618362	
92-102	19:13363	OSTI; NTIS (US Sales Only); INIS		DE94618363	
92-104	19:13501	OSTI; NTIS (US Sales Only); INIS		DE94618520	
92-105	19:13781	OSTI; NTIS (US Sales Only); INIS		DE94618694	
92-110	19:13502	OSTI; NTIS (US Sales Only); INIS		DE94618521	
92-25	19:13462	OSTI; NTIS (US Sales Only); INIS		DE94618466	
92-63	19:13361	OSTI; NTIS (US Sales Only); INIS		DE94618364	
93-05	19:13503	OSTI; NTIS (US Sales Only); INIS		DE94618515	
93-06	19:13412	OSTI; NTIS (US Sales Only); INIS		DE94618439	
93-08	19:13504	OSTI; NTIS (US Sales Only); INIS		DE94618516	
IPP–					
6/316	19:14049	OSTI; NTIS (US Sales Only); INIS		DE94752358	
IS–					
5012	19:12142	*See* SAND–92-7308			
5104	19:13097	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007459	MF-900
IS-T–					
1627	19:12680	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007060	MF-401
1704	19:14249	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007061	MF-405
ISRP-K-TD–					
1	19:12779	OSTI; NTIS (US Sales Only); INIS		DE94616243	
2	19:12952	OSTI; NTIS (US Sales Only); INIS		DE94616486	
ISTISAN–					
92-38	19:12104	OSTI; NTIS (US Sales Only)		DE94752634	
92-39	19:13319	OSTI; NTIS (US Sales Only)		DE94752598	
ITF–					
92-10R	19:13364	OSTI; NTIS (US Sales Only); INIS		DE94616618	
92-11U	19:13707	OSTI; NTIS (US Sales Only); INIS		DE94616989	
92-23R	19:13708	OSTI; NTIS (US Sales Only); INIS		DE94616990	
92-26R	19:13505	OSTI; NTIS (US Sales Only); INIS		DE94618503	
92-32R	19:13923	OSTI; NTIS (US Sales Only); INIS		DE94617391	
92-33R	19:13682	OSTI; NTIS (US Sales Only); INIS		DE94618591	
92-37R	19:14050	OSTI; NTIS (US Sales Only); INIS		DE94617188	
92-43R	19:13709	OSTI; NTIS (US Sales Only); INIS		DE94616991	
92-47R	19:13924	OSTI; NTIS (US Sales Only); INIS		DE94617392	
92-48U	19:13710	OSTI; NTIS (US Sales Only); INIS		DE94616992	
92-49R	19:13782	OSTI; NTIS (US Sales Only); INIS		DE94617004	
93-11U	19:13041	OSTI; NTIS (US Sales Only); INIS		DE94615849	
93-12R	19:13783	OSTI; NTIS (US Sales Only); INIS		DE94618677	
93-14R	19:13683	OSTI; NTIS (US Sales Only); INIS		DE94618613	
93-17R	19:13698	OSTI; NTIS (US Sales Only); INIS		DE94616981	
93-18U	19:13925	OSTI; NTIS (US Sales Only); INIS		DE94617393	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-25R	19:13784	OSTI; NTIS (US Sales Only); INIS		DE94618678	
93-27R	19:13699	OSTI; NTIS (US Sales Only); INIS		DE94616982	
93-2R	19:14051	OSTI; NTIS (US Sales Only); INIS		DE94617189	
93-3R	19:13506	OSTI; NTIS (US Sales Only); INIS		DE94616787	
93-4R	19:13697	OSTI; NTIS (US Sales Only); INIS		DE94616983	
ITL/IS-JULK–					
6	19:13042	OSTI; NTIS		DE94722041	
8	19:13043	OSTI; NTIS		DE94722043	
ITP–					
92-40E	19:13507	OSTI; NTIS (US Sales Only); INIS		DE94616853	
92-51E	19:13684	OSTI; NTIS (US Sales Only); INIS		DE94616951	
92-54E	19:12526	OSTI; NTIS (US Sales Only); INIS		DE94615510	
92-65E	19:13815	OSTI; NTIS (US Sales Only); INIS		DE94617047	
93-12E	19:12527	OSTI; NTIS (US Sales Only); INIS		DE94615511	
93-13E	19:14052	OSTI; NTIS (US Sales Only); INIS		DE94617215	
93-14E	19:13602	OSTI; NTIS (US Sales Only); INIS		DE94616887	
93-16E	19:13917	OSTI; NTIS (US Sales Only); INIS		DE94617360	
93-18E	19:13918	OSTI; NTIS (US Sales Only); INIS		DE94617361	
93-21E	19:13463	OSTI; NTIS (US Sales Only); INIS		DE94616660	
93-22E	19:13464	OSTI; NTIS (US Sales Only); INIS		DE94618467	
93-24E	19:13711	OSTI; NTIS (US Sales Only); INIS		DE94616993	
93-25E	19:13603	OSTI; NTIS (US Sales Only); INIS		DE94616888	
93-29E	19:13366	OSTI; NTIS (US Sales Only); INIS		DE94616619	
93-30E	19:12579	OSTI; NTIS (US Sales Only); INIS		DE94615646	
93-31E	19:13604	OSTI; NTIS (US Sales Only); INIS		DE94616889	
93-32E	19:13465	OSTI; NTIS (US Sales Only); INIS		DE94616768	
93-36E	19:13466	OSTI; NTIS (US Sales Only); INIS		DE94616769	
93-37E	19:12580	OSTI; NTIS (US Sales Only); INIS		DE94615647	
93-38E	19:13685	OSTI; NTIS (US Sales Only); INIS		DE94616952	
93-40E	19:13836	OSTI; NTIS (US Sales Only); INIS		DE94617057	
93-4E	19:13863	OSTI; NTIS (US Sales Only); INIS		DE94617087	
93-5E	19:13365	OSTI; NTIS (US Sales Only); INIS		DE94616620	
93-8E	19:13508	OSTI; NTIS (US Sales Only); INIS		DE94616799	
ITP-UH–					
1/93	19:13442	*See* DESY–93-050			
18/93	19:13395	*See* DESY–93-082			
2/93	19:13441	*See* DESY–93-049			
ITRI–					
140	19:13320	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007458	PC-408
IYaF–					
91-25	19:12914	OSTI; NTIS (US Sales Only); INIS		DE94616234	
91-27.	19:13385	*See* INP–91-27			
91-43	19:12857	OSTI; NTIS (US Sales Only); INIS		DE94616176	
91-44	19:12915	OSTI; NTIS (US Sales Only); INIS		DE94618118	
91-45.	19:13835	*See* INP–91-45			
91-46	19:13509	OSTI; NTIS (US Sales Only); INIS		DE94618504	
91-80.	19:13500	*See* INP–91-80			
91-91	19:13605	OSTI; NTIS (US Sales Only); INIS		DE94618536	
91-96	19:12953	OSTI; NTIS (US Sales Only); INIS		DE94616453	
92-2	19:13510	OSTI; NTIS (US Sales Only); INIS		DE94616788	
92-16	19:14053	OSTI; NTIS (US Sales Only); INIS		DE94617190	
92-28	19:12954	OSTI; NTIS (US Sales Only); INIS		DE94616454	
92-31	19:12824	OSTI; NTIS (US Sales Only); INIS		DE94616112	
92-33	19:13367	OSTI; NTIS (US Sales Only); INIS		DE94618365	
92-36	19:14054	OSTI; NTIS (US Sales Only); INIS		DE94618779	
92-40	19:12916	OSTI; NTIS (US Sales Only); INIS		DE94618119	
92-42	19:14250	OSTI; NTIS (US Sales Only); INIS		DE94616604	
92-49	19:13686	OSTI; NTIS (US Sales Only); INIS		DE94616968	
92-62	19:12858	OSTI; NTIS (US Sales Only); INIS		DE94616201	
92-66	19:13785	OSTI; NTIS (US Sales Only); INIS		DE94617006	
92-79	19:12917	OSTI; NTIS (US Sales Only); INIS		DE94616235	
92-94	19:13606	OSTI; NTIS (US Sales Only); INIS		DE94616907	
93-5	19:14055	OSTI; NTIS (US Sales Only); INIS		DE94617216	
93-12	19:13368	OSTI; NTIS (US Sales Only); INIS		DE94616621	
JAERI-CONF–					
2	19:13896	*See* JAERI-M–93-228			
JAERI-M–					
93-154	19:12239	OSTI; NTIS; INIS		DE94748537	
93-157	19:12124	OSTI; NTIS; INIS		DE94748538	
93-164	19:12139	OSTI; NTIS; INIS		DE94748540	
93-165	19:12187	OSTI; NTIS; INIS		DE94748539	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-166	19:12188	OSTI; NTIS; INIS		DE94748541	
93-171	19:12730	OSTI; NTIS; INIS		DE94748554	
93-177	19:14251	OSTI; NTIS; INIS		DE94748556	
93-180	19:14252	OSTI; NTIS; INIS		DE94748555	
93-193	19:14056	OSTI; NTIS; INIS		DE94748659	
93-217	19:11875	OSTI; NTIS; INIS		DE94748670	
93-221	19:12140	OSTI; NTIS; INIS		DE94748660	
93-222	19:11624	OSTI; NTIS; INIS		DE94748661	
93-223	19:12160	OSTI; NTIS; INIS		DE94748671	
93-226	19:12240	OSTI; NTIS; INIS		DE94748693	
93-227	19:12268	OSTI; NTIS; INIS		DE94748672	
93-228	19:13896	OSTI; NTIS; INIS		DE94748692	
93-237	19:12241	OSTI; NTIS; INIS		DE94748685	
93-239	19:12242	OSTI; NTIS; INIS		DE94748686	
93-241	19:12859	OSTI; NTIS; INIS		DE94748689	
JINR–					
13-93-219	19:12861	OSTI; NTIS (US Sales Only); INIS		DE94618105	
2-93-59	19:13786	OSTI; NTIS (US Sales Only); INIS		DE94618106	
3-93-60	19:13926	OSTI; NTIS (US Sales Only); INIS		DE94618212	
6-92-57	19:13467	OSTI; NTIS (US Sales Only); INIS		DE94618202	
JINR-D–					
13-93-222	19:12991	OSTI; NTIS (US Sales Only); INIS		DE94618238	
JINR-E–					
1-92-372	19:13793	OSTI; NTIS (US Sales Only); INIS		DE94617044	
1-93-253	19:14253	OSTI; NTIS (US Sales Only); INIS		DE94618340	
13-93-234	19:12959	OSTI; NTIS (US Sales Only); INIS		DE94618211	
2-92-175	19:13512	OSTI; NTIS (US Sales Only); INIS		DE94618505	
2-93-164	19:13513	OSTI; NTIS (US Sales Only); INIS		DE94616800	
2-93-193	19:13470	OSTI; NTIS (US Sales Only); INIS		DE94618468	
2-93-201	19:13687	OSTI; NTIS (US Sales Only); INIS		DE94618586	
3-93-205	19:13794	OSTI; NTIS (US Sales Only); INIS		DE94618657	
4-93-196	19:13611	OSTI; NTIS (US Sales Only); INIS		DE94618549	
4-93-223	19:13688	OSTI; NTIS (US Sales Only); INIS		DE94618592	
4-93-238	19:13689	OSTI; NTIS (US Sales Only); INIS		DE94618614	
4-93-262	19:13795	OSTI; NTIS (US Sales Only); INIS		DE94618695	
7-93-278	19:13796	OSTI; NTIS (US Sales Only); INIS		DE94618679	
9-93-273	19:12862	OSTI; NTIS (US Sales Only); INIS		DE94618110	
JINR-R–					
1-93-195	19:12960	OSTI; NTIS (US Sales Only); INIS		DE94616455	
10-93-271	19:13612	OSTI; NTIS (US Sales Only); INIS		DE94618542	
11-93-256	19:14256	OSTI; NTIS (US Sales Only); INIS		DE94618342	
14-93-247	19:13865	OSTI; NTIS (US Sales Only); INIS		DE94618747	
15-93-218	19:13797	OSTI; NTIS (US Sales Only); INIS		DE94618650	
2-92-485	19:13343	OSTI; NTIS (US Sales Only); INIS		DE94616613	
2-93-160	19:13690	OSTI; NTIS (US Sales Only); INIS		DE94616928	
2-93-246	19:13714	OSTI; NTIS (US Sales Only); INIS		DE94618645	
4-93-198	19:13856	OSTI; NTIS (US Sales Only); INIS		DE94618732	
4-93-199	19:13857	OSTI; NTIS (US Sales Only); INIS		DE94618733	
4-93-200	19:13864	OSTI; NTIS (US Sales Only); INIS		DE94618748	
6-92-427	19:14254	OSTI; NTIS (US Sales Only); INIS		DE94616509	
6-93-139	19:12961	OSTI; NTIS (US Sales Only); INIS		DE94616426	
6-93-233	19:13691	OSTI; NTIS (US Sales Only); INIS		DE94618593	
9-93-240	19:14255	OSTI; NTIS (US Sales Only); INIS		DE94618343	
9-93-272	19:13471	OSTI; NTIS (US Sales Only); INIS		DE94618452	
Juel–					
2550	19:13044	OSTI; NTIS (US Sales Only)		DE94752379	
2679	19:11901	OSTI; NTIS (US Sales Only)		DE94747577	
2701	19:13613	OSTI; NTIS (US Sales Only); INIS		DE94746040	
2721	19:12269	OSTI; NTIS (US Sales Only); INIS		DE94752453	
2725	19:12581	OSTI; NTIS (US Sales Only)		DE94752367	
2738	19:12611	OSTI; NTIS (US Sales Only)		DE94747625	
2747	19:12612	OSTI; NTIS (US Sales Only); INIS		DE94752461	
2750	19:11537	OSTI; NTIS (US Sales Only)		DE94747609	
2763	19:12377	OSTI; NTIS (US Sales Only)		DE94747634	
2769	19:12528	OSTI; NTIS (US Sales Only)		DE94747629	
2776	19:13045	OSTI; NTIS (US Sales Only)		DE94747335	
2799	19:14057	OSTI; NTIS (US Sales Only); INIS		DE94747513	
K/NSP–					
165	19:11877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006678	
KAERI/AR–					
354/92	19:11884	OSTI; NTIS (US Sales Only); INIS		DE94618041	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
KCL-KUITU–					
30	19:12427	OSTI; NTIS		DE94722019	
KCP–					
613-5236	19:11705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004815	MF-707
613-5307	19:12428	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003824	MF-706
KEK–					
93-1	19:12863	OSTI; NTIS; INIS		DE94748636	
93-2	19:12918	OSTI; NTIS; INIS		DE94748585	
93-3	19:12864	OSTI; NTIS; INIS		DE94748552	
93-4	19:12865	OSTI; NTIS; INIS		DE94748551	
93-5	19:12919	OSTI; NTIS; INIS		DE94748550	
93-6	19:12866	OSTI; NTIS; INIS		DE94748549	
93-7	19:12867	OSTI; NTIS; INIS		DE94748548	
93-8	19:12868	OSTI; NTIS; INIS		DE94748635	
KEK-PR–					
93-1	19:12869	OSTI; NTIS; INIS		DE94748682	
KEK-PROC–					
92-17	19:12894	OSTI; NTIS; INIS		DE94748683	
93-1	19:12895	OSTI; NTIS; INIS		DE94748546	
93-5	19:12896	OSTI; NTIS; INIS		DE94748547	
93-6	19:12897	OSTI; NTIS; INIS		DE94748553	
93-13	19:12898	OSTI; NTIS; INIS		DE94748637	
KFK–					
5024	19:12158	OSTI; NTIS (US Sales Only); INIS		DE94747611	
5101	19:11876	OSTI; NTIS (US Sales Only); INIS		DE94752390	
5122	19:13876	OSTI; NTIS (US Sales Only); INIS		DE94745997	
5127	19:13798	OSTI; NTIS (US Sales Only); INIS		DE94752378	
5155	19:12159	OSTI; NTIS (US Sales Only); INIS		DE94747546	
5159	19:13027	OSTI; NTIS (US Sales Only)		DE94752368	
5162	19:12270	OSTI; NTIS (US Sales Only); INIS		DE94752459	
5168	19:13098	OSTI; NTIS (US Sales Only)		DE94747641	
5170	19:13799	OSTI; NTIS (US Sales Only); INIS		DE94745996	
5181	19:12962	OSTI; NTIS (US Sales Only); INIS		DE94752457	
5182	19:12654	OSTI; NTIS (US Sales Only)		DE94752458	
5183	19:13046	OSTI; NTIS (US Sales Only)		DE94747642	
5190	19:12963	OSTI; NTIS (US Sales Only); INIS		DE94747337	
5192	19:14192	OSTI; NTIS (US Sales Only); INIS		DE94752409	
5205	19:13283	OSTI; NTIS (US Sales Only); INIS		DE94747545	
5226	19:12322	OSTI; NTIS (US Sales Only); INIS		DE94747336	
KFK-PEF–					
102	19:12457	OSTI; NTIS (US Sales Only)		DE94752366	
95	19:13047	OSTI; NTIS (US Sales Only)		DE94752389	
KFK-PUG–					
5	19:13047	*See* KFK-PEF–95			
11	19:13321	OSTI; NTIS (US Sales Only)		DE94752451	
KTM/E-B–					
142	19:12400	OSTI; NTIS		DE94721995	
150	19:12347	OSTI; NTIS		DE94721996	
156	19:11507	OSTI; NTIS		DE94721997	
158	19:11418	OSTI; NTIS		DE94721998	
KURRI-TR–					
374	19:13164	OSTI; NTIS; INIS		DE94748703	
377	19:13692	OSTI; NTIS; INIS		DE94748669	
LA–					
12628-MS	19:13906	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006132	
12629-MS	19:13907	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006131	
12652-MS	19:11706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005018	MF-814
12664-MS	19:12731	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004474	PC-731
12674	19:13908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006130	
12699	19:13048	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008625	MF-902
12700	19:11849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007116	MF-714
12703-SR	19:11707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007726	MF-810
12712-MS	19:13330	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007725	MF-412
12713-MS	19:12964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007835	MF-414; MF-406
12714-MS	19:12899	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007834	MF-414; MF-406
12716-T	19:12243	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006127	MF-714
12721-PR	19:13099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005331	MF-703; MF-721
12737-M	19:12965	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008164	MF-700

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
12742-MS	19:12966	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007727	MF-940; MF-906
12748-MS	19:13002	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007724	MF-700; MF-705
12755-MS	19:12613	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007728	MF-700; MF-705
LA-SUB–					
93-227	19:13386	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008098	MF-706
93-259	19:12353	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005657	MF-528
93-296	19:12316	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008097	MF-900
94-25	19:12327	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005662	MF-900
94-26	19:12783	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005661	MF-706
94-28	19:12732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005658	MF-722
94-39	19:12968	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008075	MF-706; MF-705
94-41	19:12582	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008096	MF-701; MF-704
94-45	19:12681	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008167	MF-701
LA-UR–					
93-2793	19:12333	OSTI; NTIS; GPO Dep.	E 1.99:	DE93018287	MF-900
93-2864	19:14257	OSTI; NTIS; GPO Dep.	E 1.99:	DE93040251	MF-900
93-3456	19:12583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006790	MF-906
93-3467	19:13886	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000682	MF-905
93-4097	19:12733	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006211	MF-701
93-4245	19:13049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004991	MF-902
93-4375	19:13414	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006221	
93-4412	19:13134	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005094	MF-408; MF-400
93-4438	19:14258	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005089	MF-705
93-4455	19:11708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005085	MF-714
93-4512	19:12902	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005014	MF-907
93-4520	19:12529	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007527	MF-904
93-4526	19:13050	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004974	MF-902
94-0153	19:13011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006274	MF-700
94-0165	19:13169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006270	MF-408
94-0256	19:12469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006242	MF-900
94-0384	19:13800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006157	MF-413
94-0386	19:13693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006159	MF-413
94-100	19:13168	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006236	MF-708
94-101	19:13051	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006235	MF-702
94-110	19:13152	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006234	MF-705; MF-708
94-121	19:12271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006237	
94-152	19:12903	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006275	
94-154	19:12467	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006273	MF-700
94-16	19:13165	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006231	MF-908
94-164	19:12468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006271	MF-906
94-17	19:13166	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006232	MF-908
94-187	19:11709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006256	MF-721
94-204	19:13816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006255	MF-705
94-229	19:13052	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006243	MF-902
94-260	19:13817	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006240	MF-705
94-310	19:12584	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006248	
94-343	19:12585	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006149	MF-706
94-361	19:11710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006152	MF-940
94-362	19:11711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006153	MF-940
94-363	19:11712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006154	MF-902; MF-940
94-409	19:11713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006162	MF-721
94-441	19:13801	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006146	MF-706
94-444	19:13003	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007529	MF-741
94-493	19:12655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007541	MF-940
94-52	19:13028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006226	MF-940
94-521	19:13128	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007547	MF-902; MF-908
94-526	19:12808	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007546	MF-706
94-528	19:12809	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007545	MF-700; MF-706
94-538	19:13919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007609	MF-910
94-557	19:11850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007578	MF-940
94-563	19:13920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007579	MF-706

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-570	19:11714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007577	MF-902
94-577	19:11963	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007574	MF-251
94-593	19:11715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007570	MF-902
94-595	19:12734	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007569	MF-714
94-597	19:12810	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007568	
94-598	19:11851	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007567	MF-721
94-604	19:14259	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007566	MF-705
94-605	19:14260	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007565	
94-606	19:13053	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007564	MF-701
94-607	19:11716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007563	MF-940
94-614	19:13415	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007562	
94-659	19:12454	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007558	MF-331
94-676	19:13616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007557	MF-413
94-691	19:13416	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006998	
94-695	19:13872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007553	MF-411
94-713	19:13802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007552	MF-413
94-715	19:11717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007550	MF-802
94-78	19:13167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006223	MF-408
LAL–					
91-69	19:13614	OSTI; NTIS (US Sales Only); INIS		DE94618555	
91-74	19:13615	OSTI; NTIS (US Sales Only); INIS		DE94618528	
LAL-RT–					
91-14	19:12900	OSTI; NTIS (US Sales Only); INIS		DE94618107	
93-02	19:12967	OSTI; NTIS (US Sales Only); INIS		DE94618213	
93-03	19:12842	OSTI; NTIS (US Sales Only); INIS		DE94618103	
93-04	19:13909	OSTI; NTIS (US Sales Only); INIS		DE94618849	
93-06	19:12901	OSTI; NTIS (US Sales Only); INIS		DE94618111	
LAPP-TH–					
335-91	19:13472	OSTI; NTIS (US Sales Only); INIS		DE94618487	
LBL–					
30971	19:13193	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007493	PC-605
31742	19:14261	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004668	MF-350
32183	19:12401	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007501	MF-902
33342	19:12402	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007503	
33587	19:12403	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007497	MF-350
33819	19:12378	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007504	
33962	19:12404	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007492	PC-350
34144	19:12338	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007500	MF-350
34555	19:12331	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007498	MF-350
34880	19:13921	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007038	MF-404
34881	19:12614	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007032	MF-404
34882	19:13897	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007037	MF-404
34883	19:13898	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007031	MF-404
34911	19:13514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007043	MF-413
34991	19:12530	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007033	MF-404
35023	19:12825	*See* SLAC–430			
35036	19:12405	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007044	MF-350
35037	19:13326	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007034	MF-350
35049	19:11463	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007494	MF-109
35050	19:13170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007042	MF-414
35057	19:12531	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007036	MF-404
35058	19:12843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007035	MF-414
35092	19:12969	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007495	MF-406
35155	19:12656	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007499	MF-311
90-Rev.	19:13427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007445	MF-414
LIYaF–					
1758	19:13818	OSTI; NTIS (US Sales Only); INIS		DE94617050	
LNS–					
171	19:13899	OSTI; NTIS; INIS		DE94618826	
LPCC–					
92-10	19:13694	OSTI; NTIS (US Sales Only); INIS		DE94618594	
LRP–					
483/93	19:14058	OSTI; NTIS; INIS		DE94618780	
486/93	19:14059	OSTI; NTIS; INIS		DE94617191	
LYCEN–					
9117	19:13873	OSTI; NTIS (US Sales Only); INIS		DE94618757	
9138	19:13858	OSTI; NTIS (US Sales Only); INIS		DE94618734	
9234	19:13369	OSTI; NTIS (US Sales Only); INIS		DE94618366	
9242	19:13370	OSTI; NTIS (US Sales Only); INIS		DE94618367	
9304	19:13417	OSTI; NTIS (US Sales Only); INIS		DE94618440	
9307	19:13859	OSTI; NTIS (US Sales Only); INIS		DE94618735	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
9315	19:13418	OSTI; NTIS (US Sales Only); INIS		DE94618441	
9317	19:13387	OSTI; NTIS (US Sales Only); INIS		DE94618412	
9318	19:13388	OSTI; NTIS (US Sales Only); INIS		DE94618413	
9319	19:13910	OSTI; NTIS (US Sales Only); INIS		DE94618850	
9320	19:13866	OSTI; NTIS (US Sales Only); INIS		DE94618749	
9321	19:13617	OSTI; NTIS (US Sales Only); INIS		DE94618550	
9324	19:13371	OSTI; NTIS (US Sales Only); INIS		DE94618368	
9327	19:13372	OSTI; NTIS (US Sales Only); INIS		DE94618369	
9334	19:13618	OSTI; NTIS (US Sales Only); INIS		DE94618543	
9335	19:13803	OSTI; NTIS (US Sales Only); INIS		DE94618709	
MAD/TH–					
93-07	19:13582	*See* DESY–93-131			
MLM–					
3791	19:13100	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007754	PC-700
MPI-PhE–					
93-18	19:13619	OSTI; NTIS (US Sales Only); INIS		DE94752165	
93-19	19:13620	OSTI; NTIS (US Sales Only); INIS		DE94747549	
93-21	19:12970	OSTI; NTIS (US Sales Only); INIS		DE94747401	
93-22	19:13621	OSTI; NTIS (US Sales Only); INIS		DE94752164	
93-24	19:13655	OSTI; NTIS (US Sales Only); INIS		DE94752163	
93-29	19:12971	OSTI; NTIS (US Sales Only); INIS		DE94752162	
MSHA/IR–					
1212	19:11530	OSTI; NTIS		DE94001241	
MSU-CL–					
883.	19:13706	*See* IPNO-DRE–93-10			
NASA-CR–					
191197	19:12450	*See* DOE/NASA–0373-1			
NDRL–					
3674	19:12691	*See* DOE/ER/00038–3674			
NEI-DK–					
1359	19:11719	OSTI; NTIS; INIS		DE94618268	
1374	19:12180	OSTI; NTIS; INIS		DE94618141	
NEI-FI–					
214	19:11894	OSTI; NTIS		DE94722037	
215	19:13054	OSTI; NTIS		DE94722022	
216	19:12445	OSTI; NTIS		DE94721993	
218	19:12317	OSTI; NTIS		DE94721990	
219	19:11508	OSTI; NTIS		DE94722029	
NEI-NG–					
384	19:11556	OSTI; NTIS		DE94743501	
385	19:11560	OSTI; NTIS		DE94743504	
386	19:13055	OSTI; NTIS		DE94743505	
387	19:12772	OSTI; NTIS		DE94743506	
388	19:12286	OSTI; NTIS		DE94743507	
389	19:11557	OSTI; NTIS		DE94743508	
390	19:13056	OSTI; NTIS		DE94743509	
NEI-SE–					
141	19:12125	OSTI; NTIS; INIS		DE94616303	
142	19:12972	OSTI; NTIS; INIS		DE94616487	
143	19:13101	OSTI; NTIS; INIS		DE94615814	
145	19:14285	OSTI; NTIS; INIS		DE94616595	
NIFS–					
219	19:14060	OSTI; NTIS; INIS		DE94748497	
NIIEFA-P-B–					
0884	19:12904	OSTI; NTIS (US Sales Only); INIS		DE94616168	
0891	19:14061	OSTI; NTIS (US Sales Only); INIS		DE94617114	
0896	19:14062	OSTI; NTIS (US Sales Only); INIS		DE94617116	
0904	19:14193	OSTI; NTIS (US Sales Only); INIS		DE94617257	
NIIEFA-P-K–					
0887	19:12905	OSTI; NTIS (US Sales Only); INIS		DE94616202	
NIIEFA-P-NILSA–					
0880	19:14194	OSTI; NTIS (US Sales Only); INIS		DE94617253	
NIIEFA-P-V–					
0869	19:14262	OSTI; NTIS (US Sales Only); INIS		DE94616605	
NIIYaF-MGU–					
91-14-218	19:13473	OSTI; NTIS (US Sales Only); INIS		DE94616661	
91-16-220	19:13804	OSTI; NTIS (US Sales Only); INIS		DE94617010	
91-20-224	19:13805	OSTI; NTIS (US Sales Only); INIS		DE94617011	
91-4-208	19:13419	OSTI; NTIS (US Sales Only); INIS		DE94616637	
92-11-260	19:12973	OSTI; NTIS (US Sales Only); INIS		DE94616488	
92-40-289	19:13715	OSTI; NTIS (US Sales Only); INIS		DE94616994	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
92-41-290.	19:13654	*See* INP-MSU–92-41-290			
92-8-257	19:13819	OSTI; NTIS (US Sales Only); INIS		DE94617051	
93-3-295.	19:13411	*See* INP-MSU–93-3-295			
NIPER–					
658	19:11561	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008171	MF-122
NIRS-RSD–					
100	19:13130	OSTI; NTIS; INIS		DE94748690	
101	19:13223	OSTI; NTIS; INIS		DE94748691	
NKS–					
93-9	19:14223	OSTI; NTIS; INIS		DE94618346	
NPL-RSA(EXT)–					
34	19:11888	OSTI; NTIS (US Sales Only); INIS		DE94618045	
NREL/TP–					
411-5815	19:11945	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000202	MF-270
411-6263	19:11946	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000294	MF-270
411-6264	19:11947	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000295	MF-270
411-6292	19:11941	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000297	MF-270
411-6396	19:11948	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000298	MF-271
451-6135	19:11949	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000291	MF-271
451-6192	19:11950	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000292	MF-271
451-6215	19:11951	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000293	MF-273
NSS-R–					
272	19:12682	OSTI; NTIS (US Sales Only); INIS		DE94615302	
NUKEM-FuE–					
91015	19:14278	OSTI; NTIS (US Sales Only); INIS		DE94752436	
NUREG–					
0430-Vol.13	19:11653	OSTI; NTIS; INIS; GPO		TI94007837	
1100-Vol.10	19:12300	OSTI; NTIS; GPO; INIS		TI94007068	
1435-Suppl.3	19:12272	OSTI; NTIS; INIS; GPO		TI94005403	
1486	19:11720	OSTI; NTIS; INIS; GPO		TI94006735	
1491	19:11609	OSTI; NTIS; INIS; GPO		TI94006028	
NUREG/CR–					
4816-Rev.2	19:12175	OSTI; NTIS; INIS; GPO		TI94006457	
4833	19:12974	OSTI; NTIS; INIS; GPO		TI94006055	
5569-Rev.1	19:13293	OSTI; NTIS; INIS; GPO		TI94007599	
5812	19:12273	OSTI; NTIS; INIS; GPO		TI94006453	
5935	19:12274	OSTI; NTIS; INIS; GPO		TI94007115	
5990	19:12176	OSTI; NTIS; INIS; GPO		TI94005979	
6063	19:11721	OSTI; NTIS; INIS; GPO		TI94005993	
6076	19:12244	OSTI; NTIS; INIS; GPO		TI94007600	
6114-Vol.1	19:11722	OSTI; NTIS; INIS; GPO		TI94005330	
6138	19:11723	OSTI; NTIS; INIS; GPO		TI94007833	
6139	19:12532	OSTI; NTIS; INIS; GPO		TI94007831	
6147-Vol.1	19:11724	OSTI; NTIS; INIS; GPO		TI94007616	
6147-Vol.2	19:11725	OSTI; NTIS; INIS; GPO		TI94007617	
6147-Vol.3	19:11726	OSTI; NTIS; INIS; GPO		TI94007618	
6147-Vol.4	19:11727	OSTI; NTIS; INIS; GPO		TI94007619	
6147-Vol.5	19:11728	OSTI; NTIS; INIS; GPO		TI94007620	
6147-Vol.6	19:11729	OSTI; NTIS; INIS; GPO		TI94007621	
6147-Vol.7	19:11730	OSTI; NTIS; INIS; GPO		TI94007622	
6169	19:12275	OSTI; NTIS; INIS; GPO		TI94007832	
NUREG/GR–					
0008	19:12276	OSTI; NTIS; INIS; GPO		TI94007615	
NUREG/IA–					
0114	19:12141	OSTI; NTIS; INIS; GPO		TI94008492	
0121	19:12277	OSTI; NTIS; INIS; GPO		TI94005298	
NYSERDA–					
94-2	19:12406	OSTI; New York State Energy Research and Development Authority, Two Rockefeller Plaza, Albany, NY 12223		TI94008165	
NYU-Th–					
93/06/05	19:13486	*See* DESY–93-074			
ORISE–					
92/K-61	19:13146	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000642	MF-900
ORNL–					
6747	19:11573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008242	MF-121
6751	19:11562	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007131	MF-900
6788	19:14224	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007409	MF-400
ORNL/CON–					
318	19:12407	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007916	MF-350

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
ORNL/ER–					
158-D1	19:11687	*See* DOE/OR–01-1192-D1			
164	19:11852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008063	MF-902
172	19:11808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008061	MF-902
204	19:11731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008062	MF-902
208	19:11853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004745	MF-902
ORNL/ER/Sub–					
87-99053/31	19:12658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001483	MF-902
ORNL/FTR–					
4813	19:12177	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94002186	
4837	19:12659	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004047	MF-404
4848	19:14063	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004463	MF-420
4860	19:14195	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004462	MF-420
4866	19:12975	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004459	MF-413
ORNL/M–					
1572	19:12336	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002589	MF-630
3022	19:11732	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002775	MF-402
3023	19:11809	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007085	MF-402
3155	19:12586	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008494	MF-332
3198	19:12533	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007915	
ORNL/Sub–					
86-SD861/01	19:12587	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007132	MF-114
ORNL/TM–					
10328/R2	19:12175	*See* NUREG/CR–4816-Rev.2			
12067-Rev.1	19:13293	*See* NUREG/CR–5569-Rev.1			
12321	19:12345	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007054	MF-900
12415	19:12244	*See* NUREG/CR–6076			
12499	19:12429	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004930	
12506	19:14263	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004788	MF-405
12513	19:12532	*See* NUREG/CR–6139			
12626	19:13102	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007197	
12633	19:13057	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007316	MF-101
12642	19:11654	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007918	MF-902
12651	19:14279	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005442	MF-400
12698	19:12146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008493	MF-522
OY/PSTL-RR–					
109	19:12318	OSTI; NTIS		DE94722020	
112	19:11509	OSTI; NTIS; INIS		DE94722021	
OY/TTO-DP–					
4	19:12319	OSTI; NTIS; INIS		DE94722023	
PATENTS-US–					
A7811221	19:13147	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007362	MF-408
A7811222	19:13806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005160	MF-408
A7817009	19:12811	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007361	MF-706
A7819244	19:12735	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007360	MF-506
A7820462	19:12615	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007359	MF-504
A7820463	19:12736	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007358	MF-706
A7825225	19:12976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007356	MF-406
A7826697	19:12352	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007355	MF-112
A7829346	19:12660	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007353	MF-704; MF-706
A7831017	19:12661	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007352	MF-500
A7832156	19:12616	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007351	MF-704
A7832567	19:12992	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007350	MF-706
A7833216	19:12737	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007349	MF-706
A7834747	19:12993	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007348	MF-706
A7836747	19:12617	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007347	MF-401
A7841109	19:12278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007343	MF-506
A7841114	19:13153	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007342	MF-706; MF-708
A7841169	19:12354	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007341	MF-706
A7841170	19:12618	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007340	MF-706
A7843027	19:12738	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007339	MF-700
A7843334	19:12662	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007338	MF-706
A7844326	19:12739	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007337	MF-706
A7848583	19:12812	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007335	MF-706
A7850475	19:12813	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007334	MF-706
A7850478	19:11464	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007333	MF-106
A7850634	19:12814	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007332	MF-706
A7850642	19:12815	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007331	MF-706
A7851390	19:12451	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007330	MF-104

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PCCF-RI–					
92-02	19:13622	OSTI; NTIS (US Sales Only); INIS		DE94618556	
92-12	19:13623	OSTI; NTIS (US Sales Only); INIS		DE94618529	
92-13	19:13624	OSTI; NTIS (US Sales Only); INIS		DE94618530	
93-01	19:13625	OSTI; NTIS (US Sales Only); INIS		DE94618531	
93-02	19:13626	OSTI; NTIS (US Sales Only); INIS		DE94618532	
93-03	19:13171	OSTI; NTIS (US Sales Only); INIS		DE94618036	
93-04	19:13172	OSTI; NTIS (US Sales Only); INIS		DE94618037	
93-05	19:13173	OSTI; NTIS (US Sales Only); INIS		DE94618038	
93-08	19:13174	OSTI; NTIS (US Sales Only); INIS		DE94617841	
93-09	19:13656	OSTI; NTIS (US Sales Only); INIS		DE94618561	
93-10	19:13657	OSTI; NTIS (US Sales Only); INIS		DE94618562	
PECD–					
7/9/610.	19:11680	*See* DOE-HMIP-RR–93/047			
PIYaF–					
1795	19:13627	OSTI; NTIS (US Sales Only); INIS		DE94618544	
PNL–					
8370	19:13025	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008648	
8383	19:13026	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008649	
8834	19:12446	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008057	MF-920
8842-Vol.1	19:11722	*See* NUREG/CR–6114-Vol.1			
8879	19:12447	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008043	MF-310
8894	19:13103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001682	
8933	19:13104	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004320	
8951	19:11841	*See* DOE/RL–93-38			
8960	19:11842	*See* DOE/RL–93-38-Exec.Summ.			
8965	19:12329	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004751	MF-920
8999	19:12632	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007464	MF-401
9002	19:12430	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006677	MF-902
9016	19:13029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006736	MF-400
9214	19:13105	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007982	
9223	19:11810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008060	MF-903
PNL-SA–					
21829	19:11733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007487	MF-940
21948	19:13304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004262	MF-601
21969	19:14264	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007482	MF-505
22008	19:11854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004361	MF-902
22151	19:12985	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004289	MF-706
22193-Vol.1	19:12431	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007489	MF-249
22193-Vol.2	19:12432	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007490	MF-249
22301	19:12994	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004271	MF-705
22431	19:11855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004292	MF-902
22718	19:12619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006219	MF-404
22723	19:11734	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008045	MF-510
22796	19:11856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004770	MF-604
22797	19:11857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008046	MF-900
22828	19:13305	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008044	MF-507; MF-504
22929	19:12295	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004311	
22991	19:13106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004267	MF-510
23007	19:11735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004786	MF-906
23035	19:11736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008056	MF-902
23042	19:13339	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007469	MF-402
23047	19:13340	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007488	MF-406
23192	19:14225	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004772	MF-500
23229	19:13058	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007479	MF-402
23271	19:11737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004771	MF-940
23331	19:11738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008055	MF-901
23410	19:12534	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008054	MF-404
23412	19:11739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004780	MF-903
23457	19:12433	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006214	MF-500
23614	19:13004	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007484	
23650	19:11882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008052	MF-902; MF-940
23676	19:12816	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008050	MF-406
23686	19:11740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008058	MF-902
23727	19:11858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008059	MF-900
PPPL–					
2957	19:13474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007664	PC-427
2960	19:14064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007662	PC-426
2961	19:14065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007661	PC-420; PC-426

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2962	19:14066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007660	PC-420; PC-421; PC-426
2970	19:14067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007659	PC-420; PC-421; PC-427
PRE–					
1342.	19:14048	*See* INPE–4621			
Q–					
146	19:12691	*See* DOE/ER/00038–3674			
RCM–					
00692	19:11741	OSTI; NTIS (US Sales Only); INIS		DE94752377	
RERF-CR–					
1-92	19:13306	OSTI; NTIS; INIS		DE94748530	
2-91	19:13307	OSTI; NTIS; INIS		DE94748532	
2-92	19:13308	OSTI; NTIS; INIS		DE94748650	
RERF-TR–					
1-92	19:13309	OSTI; NTIS; INIS		DE94748651	
12-91	19:13312	OSTI; NTIS; INIS		DE94748531	
15-91	19:13313	OSTI; NTIS; INIS		DE94748529	
18-91	19:13314	OSTI; NTIS; INIS		DE94748533	
4-92	19:13310	OSTI; NTIS; INIS		DE94748535	
8-91	19:13059	OSTI; NTIS; INIS		DE94748534	
9-91	19:13311	OSTI; NTIS; INIS		DE94748536	
RISO-HOT-DECOM-P–					
5	19:13315	OSTI; NTIS; INIS		DE94615976	
RISO-R–					
712	19:12740	OSTI; NTIS; INIS		DE94618093	
RT/AMB–					
93-13	19:13077	*See* ENEA-RT-AMB–93-13			
RT/ERG-FUS–					
93-02	19:13939	*See* ENEA-RT-ERG-FUS–93-02			
93-08	19:14140	*See* ENEA-RT-ERG-FUS–93-08			
RT/INN–					
93-16	19:14244	*See* ENEA-RT-INN–93-16			
93-32	19:13192	*See* ENEA-RT-INN–93-32			
S/RES–					
825(1993).	19:12461	*See* INIS-mf–13812			
SAND–					
91-1262	19:13005	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006636	MF-742
91-8010/3	19:12328	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007465	MF-700
92-0808	19:12245	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007251	MF-700
92-1506	19:12279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008109	PC-523
92-1706	19:14265	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007254	MF-706
92-1728	19:11959	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007839	MF-256
92-1842	19:12741	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007253	MF-940
92-2891	19:11583	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007841	MF-126
92-7308	19:12142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005313	MF-940
93-0092C	19:12906	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005244	MF-706
93-0817C	19:11742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005270	MF-802
93-1085	19:13012	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007025	MF-706
93-1274C	19:12986	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005311	MF-706
93-1526C	19:12742	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006354	MF-706
93-1545C	19:12620	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005309	MF-704; MF-701
93-1571	19:13013	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007026	MF-705
93-1635C	19:12663	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006591	MF-706
93-1724C	19:12287	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007731	MF-706
93-1764C	19:12828	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005282	MF-706
93-1765C	19:12829	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005284	MF-706
93-1785C	19:12817	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007738	MF-706; MF-704
93-1912C	19:13014	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006356	MF-741; MF-705; MF-706
93-1925C	19:12246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006373	MF-700
93-1959	19:11954	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007842	MF-237
93-2004C	19:12323	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006352	MF-700
93-2028C	19:12743	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002932	MF-706
93-2040C	19:13006	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006355	
93-2047C	19:12535	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005248	MF-404

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-2073	19:13007	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007250	MF-706
93-2077C	19:13823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006607	MF-705
93-2084C	19:13824	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007063	MF-706
93-2085C	19:13825	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007064	MF-700
93-2096	19:12475	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007255	MF-404
93-2124C	19:12281	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004670	
93-2150	19:13322	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007248	MF-607
93-2174C	19:11750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006195	MF-721
93-2204C	19:12161	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004674	
93-2263	19:11878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008111	MF-700
93-2291	19:13015	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005075	MF-700
93-2307C	19:12744	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001824	MF-706
93-2326C	19:12745	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002292	MF-706
93-2330/2	19:11751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008110	MF-940
93-2333C	19:12746	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002035	MF-706
93-2352C	19:12747	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002040	MF-706
93-2380C	19:12748	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001419	MF-906
93-2413C	19:12997	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006139	MF-706
93-2429C	19:13900	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006594	MF-706
93-2441C	19:11752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006603	MF-940
93-2470C	19:12470	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007263	MF-706
93-2474C	19:12621	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007300	MF-704
93-2528	19:11811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007249	MF-722
93-2556C	19:12773	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007858	MF-705
93-2566C	19:11510	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003105	MF-706
93-2670C	19:11753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003098	MF-903
93-2679C	19:12536	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007377	MF-704
93-2687	19:12749	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008312	PC-900
93-2702C	19:13887	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006367	MF-706
93-2704C	19:14266	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003800	MF-705
93-3792	19:13008	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007753	MF-744
93-3829C	19:12750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007914	MF-706
93-3865C	19:13016	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006145	MF-700
93-3872C	19:12588	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007295	MF-704
93-3899	19:12034	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007583	MF-212
93-3961C	19:12434	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005101	MF-706
93-3966C	19:11754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007730	MF-900
93-3967C	19:13030	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007744	MF-700
93-3979C	19:14267	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005274	MF-705
93-3996C	19:12247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006521	MF-700
93-4040C	19:12998	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005268	MF-706
93-4085	19:14226	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007843	MF-700
93-4088	19:14268	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007844	MF-705
93-4097C	19:11755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005588	MF-814
93-4104C	19:14269	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005352	MF-700
93-7026	19:11952	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007752	MF-236
93-7072	19:12774	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008112	MF-705
93-8221	19:12999	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007466	MF-706
93-8688	19:13148	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007525	MF-405
94-0107C	19:11756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007729	MF-940
94-0123C	19:12751	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006368	MF-700
94-0139	19:13024	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007252	MF-706
94-0158	19:13922	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008113	MF-706
94-0163C	19:12818	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007743	MF-706
94-0196C	19:12324	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006364	MF-706
94-0254C	19:12752	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007859	MF-706
94-0276C	19:11812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006601	MF-902
94-0283C	19:12537	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006606	MF-704
94-0314	19:12476	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007584	MF-404
94-0317C	19:13888	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007932	MF-410
94-0380C	19:12294	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006582	MF-706
94-0390C	19:11558	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007302	MF-122
94-0402C	19:12819	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006593	MF-705
94-0441C	19:13020	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007375	MF-706
94-0527C	19:12035	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007065	MF-109
94-0552C	19:12350	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007737	MF-234
94-0658C	19:11757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007741	MF-940
94-8204	19:12664	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006397	MF-401
94-8207	19:11758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004813	MF-902
94-8219	19:12622	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008231	MF-704
94-8524	19:12708	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006676	MF-361

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-8535	19:12753	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007467	MF-406
SCPRI-RM–					
04-1993	19:13107	OSTI; NTIS (US Sales Only); INIS		DE94617769	
SKB-TR–					
93-14	19:11759	OSTI; NTIS; INIS		DE94616529	
93-15	19:13108	OSTI; NTIS; INIS		DE94615837	
93-18	19:11760	OSTI; NTIS; INIS		DE94616530	
SKI-TR–					
93-30	19:11761	OSTI; NTIS; INIS		DE94614091	
SLAC–					
362	19:14270	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007668	PC-405
424	19:13658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007665	PC-414
426	19:13628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007257	PC-414
427	19:12623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007259	PC-404; PC-410; PC-411
428-Vol.3	19:13515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008437	PC-414
430	19:12825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008435	PC-414
431	19:12907	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007667	PC-414
434	19:12624	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007258	PC-404
435	19:13629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007666	PC-414
SLAC-PUB–					
6328	19:13659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007096	MF-414
6390	19:12977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006439	MF-414
6405	19:13420	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007094	MF-412
6406	19:13421	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007093	MF-412
6417	19:12830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007092	MF-414
6430	19:13630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007095	MF-414
SLAC/SSRL–					
0061	19:12623	*See* SLAC–427			
0065	19:12624	*See* SLAC–434			
SPEC–					
91-078.	19:13892	*See* CEA-CONF–11444			
SPhT–					
91-161.	19:13390	*See* CEA-CONF–11442			
91-24.	19:13435	*See* CEA-CONF–11440			
SR–					
90-R-552731	19:12411	*See* DOE/CE/40812–1			
SR/H–					
665	19:12248	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94004703	MF-700
671	19:12538	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006181	MF-704
672	19:12539	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006785	MF-700
674	19:12249	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006787	MF-700
675	19:12250	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94006788	MF-700
676	19:12540	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007136	MF-706
677	19:12541	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007137	MF-706
678	19:12542	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007138	MF-706
680	19:12251	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94007140	MF-700
687	19:12252	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008390	MF-700
689	19:12178	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008392	MF-700
TKK-KO/ET–					
51	19:11527	OSTI; NTIS		DE94722028	
TKK-V-C–					
122	19:12435	OSTI; NTIS		DE94722012	
123	19:12436	OSTI; NTIS		DE94722013	
TTC–					
1275	19:12741	*See* SAND–92-1842			
1285	19:11811	*See* SAND–93-2528			
TUW–					
93-04	19:13441	*See* DESY–93-049			
UCRL–					
52000-93-11/12	19:13017	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007256	PC-700
UCRL-CR–					
114777	19:12543	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007125	MF-704
115387	19:12544	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007923	MF-401
116290	19:12820	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007921	MF-900
UCRL-ID–					
106454-94-1	19:11879	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008080	MF-700
112617	19:11762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007451	MF-721
113521	19:13109	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005650	MF-902
115383	19:11763	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007763	MF-701

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115481	19:11889	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008280	MF-700
115525	19:13826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004687	MF-700
115678	19:12589	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007757	MF-700
115705	19:12978	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007761	MF-700
115729	19:13021	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007764	MF-703
115845	19:13018	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008233	MF-700
115869	19:13889	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007847	MF-700
115962	19:14068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008279	MF-421
116110	19:12471	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007848	MF-703
116123	19:12472	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007849	MF-700
116187	19:11764	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008319	MF-700
116207	19:12460	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008308	MF-700
116209	19:14196	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008309	MF-700
116271	19:14069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008310	MF-421
116320	19:12754	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008282	MF-706
116328	19:13695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007756	MF-700
116376	19:12545	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007468	MF-404
116389	19:13009	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008311	MF-700
UCRL-JC-					
107581	19:12625	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007869	MF-704
112218	19:13422	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007456	MF-706
112646-Rev.1	19:13389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006732	MF-706
112979	19:12665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001530	MF-712
113392	19:13696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007080	MF-900
113493	19:12626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006731	MF-704
113900	19:12627	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006659	MF-704
114041	19:12755	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007029	MF-706
114133	19:12590	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008295	MF-904
114136	19:12546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007453	MF-404
114145	19:12995	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006666	MF-700
114159-Pt.2	19:12547	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007441	MF-701
114186	19:13010	OSTI; NTIS; GPO Dep.	E 1.99:	DE94001531	MF-705
114262	19:14197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006612	MF-420
114264	19:14198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006610	MF-900
114265	19:14199	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007237	MF-420
114266	19:14200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007078	MF-900
114269	19:14201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006609	MF-900
114401	19:12756	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007238	MF-706
114495	19:11893	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006614	MF-712
114578	19:12437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006725	MF-700
114598	19:14271	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007143	MF-700
114681	19:13019	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007931	MF-940; MF-902
114757	19:13808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007079	MF-900
114785	19:13154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002014	MF-708
114787	19:12628	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007120	MF-704
114789	19:14202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007123	MF-423
114794	19:12548	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007122	MF-706
114798	19:11956	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006667	MF-814
114806	19:12282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007382	MF-705
114837	19:12987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006653	MF-712
114906	19:11765	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006723	MF-706
114908	19:12549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006721	MF-704
114966	19:14203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007073	MF-712
114969	19:14204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007239	MF-712
114984	19:13423	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007124	MF-700
114997	19:14205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007930	MF-712
114998	19:14206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007028	MF-712
115120	19:12821	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007240	MF-704
115163	19:13149	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007077	MF-706
115197	19:14207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007243	MF-712
115217	19:12979	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007442	MF-906
115246	19:12629	OSTI; NTIS; GPO Dep.	E 1.99:	DE94002990	MF-900
115254	19:13341	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007455	MF-600
115273	19:11631	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007071	MF-701
115382	19:12455	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007443	MF-333
115425	19:12456	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006733	MF-900
115464	19:13424	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007452	MF-700
115488	19:11766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006611	MF-721
115500	19:14208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007242	MF-712
115602	19:13110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006663	MF-905

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
115625	19:13890	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006660	MF-700
115687	19:12822	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006049	MF-900
115698	19:12630	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007141	MF-704
115703	19:12980	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006191	MF-706
115704	19:12780	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007126	MF-704
115706	19:14227	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005823	MF-900
115709	19:12438	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007076	MF-700
115710	19:13000	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006401	
115791	19:12981	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006662	MF-706
115796	19:12631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006724	MF-804
115806	19:13891	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008216	MF-900
115840	19:14272	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006472	MF-905
115950	19:12757	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006047	MF-900
116080	19:14209	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006048	MF-700
116104	19:12683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006734	MF-901; MF-904; MF-940
116117	19:12550	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007029	MF-704
116148	19:12988	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007072	MF-706
116189	19:12908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007074	MF-414
116378	19:12591	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007380	MF-704
116851	19:13928	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008297	MF-700
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105820-88/89	19:14210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008281	PC-712
114070-3	19:12465	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005645	PC-700
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115837	19:14273	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008219	MF-905
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46/93	19:13475	OSTI; NTIS (US Sales Only); INIS		DE94616655	
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93-60	19:11767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008084	MF-814
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92-06	19:13827	OSTI; NTIS; INIS		DE94618716	
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0004-93-Vol.2	19:13316	OSTI; NTIS; GPO Dep.	E 1.99:	DE94004396	MF-607
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60	19:14228	OSTI; NTIS; INIS		DE94748687	
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1993-36	19:13661	OSTI; NTIS (US Sales Only); INIS		DE94618568	
1993-39	19:13662	OSTI; NTIS (US Sales Only); INIS		DE94618564	
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0394-7	19:13111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007149	MF-903
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0191	19:12162	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007711	MF-528
WHC-SA–					
1529	19:11859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005485	MF-940
1985	19:11768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004822	MF-940
2050	19:14229	OSTI; NTIS; GPO Dep.	E 1.99:	DE93019972	MF-900

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2254	19:11860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005418	MF-906; MF-905
2304	19:11861	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008077	MF-903
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004	19:11769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002495	MF-902
WHC-SD-EN-AP–					
122	19:11862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007147	MF-902
154	19:11863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007146	MF-940
WHC-SD-EN-EV–					
026	19:11770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007156	MF-903
WHC-SD-EN-RA–					
014	19:11864	OSTI; NTIS; GPO Dep.	E 1.99:	DE94005461	MF-902
WHC-SD-EN-TI–					
212	19:11865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006994	MF-902
219	19:13112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007148	MF-903
WHC-SD-EN-TP–					
039	19:13113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006995	MF-903
WHC-SD-WM-DP–					
018	19:11866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007985	MF-907
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92-109	19:14274	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007159	MF-705
WSRC-MS–					
93-231	19:11771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006385	MF-714
93-317	19:11772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006671	MF-721
93-380	19:11773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007283	MF-721
93-405	19:11774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006390	MF-721
93-448	19:11867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007195	MF-705
93-482	19:11775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007285	MF-706
93-491	19:11776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001750	MF-721
93-523	19:11813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003853	MF-721
93-550	19:11777	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007971	MF-701
93-576	19:14275	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007192	MF-705
93-582	19:11778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004429	MF-702
93-586	19:13060	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007191	MF-705
93-606	19:11779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006384	MF-701; MF-705
93-612	19:12781	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006673	MF-706
94-029	19:14280	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006669	MF-700
94-080	19:12552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007184	MF-704; MF-706
94-081	19:12553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007183	MF-704; MF-706
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93-1039	19:11781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007181	MF-721
93-1271-TL	19:11782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94004434	MF-721; MF-706
93-1318	19:11783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003707	MF-721
93-1319	19:11784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003706	MF-721
93-1604	19:11785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007969	MF-702
93-997	19:11780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94003698	MF-707; MF-721
94-96	19:11814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007968	MF-705; MF-702
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92-142-Rev.1	19:11786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007281	MF-721
92-557-Rev.1	19:12592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94008275	MF-701
93-346-Rev.1	19:11868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007282	MF-707; MF-721
93-414	19:11787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94001197	MF-721
93-468	19:11788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007966	MF-721
93-496	19:13114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005644	MF-702
93-526	19:13115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94005518	MF-702
93-528	19:11789	OSTI; NTIS; GPO Dep.	E 1.99:	DE94006646	MF-706
93-563	19:13116	OSTI; NTIS; GPO Dep.	E 1.99:	DE94008226	MF-701
93-568	19:13117	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007194	MF-702
93-569	19:13118	OSTI; NTIS; GPO Dep.	E 1.99:	DE94007193	MF-702
93-574	19:13119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007280	MF-702
93-595	19:12554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007145	MF-721
93-681	19:11790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94006670	MF-702; MF-721

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94-017	19:11815	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94007188	MF-702
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1043	19:11869	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003682	MF-701
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4684	19:12782	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003680	MF-706
4787	19:11792	OSTI; NTIS; GPO Dep.	E 1.99:	DE94003351	MF-702
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92-YP507C/2/P1	19:11793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94002582	MF-702
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DE94006562	CONF-940412–4
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DE94006787	SR/H–674
DE94006788	SR/H–675
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DE94006811	ANL/DIS/CP–80823
DE94006814	ANL/CMT/CP–82019
DE94006815	ANL/EA/CP–80969

Order No.	Report No.
DE94006816	ANL/CMT/CP–80853
DE94006817	ANL/CHM/CP–81225
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DE94006820	ANL/CHM/CP–81280
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DE94006822	ANL/EA/CP–81981
DE94006823	ANL/EA/CP–80825
DE94006824	ANL/ASD/CP–81176
DE94006825	ANL/EA/CP–80956
DE94006826	ANL/RE/CP–81947
DE94006827	ANL/DIS/CP–80940
DE94006828	ANL/EA/CP–80958
DE94006829	ANL/EA/CP–80824
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DE94006834	ANL/PHY/CP–81852
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DE94006836	ANL/CHM/CP–81165
DE94006837	ANL/CHM/CP–81226
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DE94006839	ANL/ER/CP–80451
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DE94006849	FNAL/C–93/388-E
DE94006951	FNAL/C–94/016-E
DE94006952	FNAL/C–94/017-E
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DE94006975	HW–33099
DE94006976	HW–37137-RD
DE94006977	HW–37228
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DE94006983	DOE/MI/10270–T1
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DE94006988	CONF-9309111–6
DE94006989	CONF-930787–6
DE94006994	WHC-SD-EN-TI–212
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DE94007010	DOE/SF/15798–T10
DE94007011	DOE/SF/15798–T11
DE94007012	DOE/SF/15798–T12
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DE94007020	DOE/EI/23956–T1
DE94007021	DOE/ER/61490–1
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DE94007048	DOE/OR/21981–T3-Vol.1
DE94007049	DOE/OR/21981–T3-Vol.2-Pt.A
DE94007050	DOE/OR/21981–T3-Vol.2-Pt.B
DE94007051	DOE/OR/21981–T3-Vol.2-Pt.C
DE94007052	DOE/OR/21981–T3-Vol.2-Pt.D
DE94007053	DOE/EM–94007053
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DE94007060	IS-T–1627
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DE94007077	UCRL-JC–115163
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DE94007084	DOE/BP/21182–2
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DE94007096	SLAC-PUB–6328
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DE94007124	UCRL-JC–114984
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DE94007126	UCRL-JC–115704
DE94007130	CONF-931081–Absts.
DE94007131	ORNL–6751
DE94007132	ORNL/Sub–86-SD861/01
DE94007136	SR/H–676
DE94007137	SR/H–677
DE94007138	SR/H–678
DE94007140	SR/H–680
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DE94007147	WHC-SD-EN-AP–122
DE94007148	WHC-SD-EN-TI–219
DE94007149	WHC-EP–0394-7
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DE94007155	DOE/BP/90299–1
DE94007156	WHC-SD-EN-EV–026
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DE94007201	DOE/AL/62350–78
DE94007202	DOE/EA–0464-Rev.3
DE94007203	DOE/AL/62350–97D
DE94007204	DOE/NV/10845–23
DE94007205	DOE/UMTRA–3050-93-1235-Vol.1
DE94007206	DOE/UMTRA–3050-93-1235-Vol.2
DE94007208	CONF-9311153–2
DE94007209	CONF-930956–2
DE94007210	CONF-940301–16
DE94007211	CONF-931009–20
DE94007212	CONF-9309119–4
DE94007214	CONF-9310167–6
DE94007215	CONF-940424–19
DE94007218	CONF-940402–5
DE94007219	CONF-940424–20
DE94007220	CONF-9310290–1
DE94007221	CONF-940424–22
DE94007224	CONF-9304148–2
DE94007229	CONF-940424–16
DE94007230	CONF-931257–1
DE94007231	DOE/FE–0287
DE94007232	DOE/HR–0066
DE94007233	DOE/EIS–0200-Exec.Summ.
DE94007234	DOE/S–0107
DE94007235	DOE/EIA–0226(94/02)
DE94007237	UCRL-JC–114265
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DE94007239	UCRL-JC–114969
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DE94007243	UCRL-JC–115197
DE94007244	DOE/OR–01-1192-D1
DE94007245	CONF-931108–83

Order No.	Report No.
DE94007246	DOE/DP–0124T
DE94007247	DOE/EH–0364T
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DE94007252	SAND–94-0139
DE94007253	SAND–92-1842
DE94007254	SAND–92-1706
DE94007255	SAND–93-2096
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DE94007258	SLAC–434
DE94007259	SLAC–427
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DE94007268	DOE/ER/40561–118
DE94007271	DOE/ER/40561–121
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DE94007281	WSRC-TR–92-142-Rev.1
DE94007282	WSRC-TR–93-346-Rev.1
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DE94007308	DOE/MC/26024–94/C0290
DE94007309	DOE/MC/28130–94/C0296
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DE94007311	DOE/MC/25105–94/C0302
DE94007313	DOE/METC/C–94/7120
DE94007316	ORNL/TM–12633
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DE94007319	DOE/MC/30139–94/C0295
DE94007320	DOE/MC/30070–94/C0289
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DE94007352	PATENTS-US–A7831017
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DE94007358	PATENTS-US–A7820463
DE94007359	PATENTS-US–A7820462
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DE94007361	PATENTS-US–A7817009
DE94007362	PATENTS-US–A7811221
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DE94007373	GA-A–21525
DE94007374	GA-A–21517
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DE94007377	SAND–93-2679C
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DE94007379	DOE/NASA–0373-1
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DE94007390	FNAL-TM–1875
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DE94007392	FNAL/C–93/359-E
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DE94007394	FNAL/C–94/014-E
DE94007396	FNAL/C–93/175
DE94007397	FNAL/C–93/174
DE94007398	FNAL/C–94/021-E
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DE94007401	FNAL/C–94/030-E
DE94007402	FNAL/C–94/020
DE94007403	DOE/ER/13442–8
DE94007409	ORNL–6788
DE94007411	DOE/EIA–0538(93/94-20)
DE94007415	CONF-940353–3
DE94007422	DOE/RL–93-0047
DE94007423	DOE/RL–90-04-Rev.2
DE94007424	DOE/RL–93-56-3
DE94007428	GA-A–21541
DE94007429	GA-A–21554
DE94007430	GA-A–21520
DE94007441	UCRL-JC–114159-Pt.2
DE94007442	UCRL-JC–115217
DE94007443	UCRL-JC–115382
DE94007444	DOE/FE–94007444
DE94007445	LBL–90-Rev.
DE94007446	DOE/AL/58309–54
DE94007447	DOE/WIPP–93-017
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DE94007449	DOE/ER/20022–T1
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DE94007452	UCRL-JC–115464
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DE94007459	IS–5104
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DE94007463	EML–558
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DE94007466	SAND–93-8221
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DE94007490	PNL-SA–22193-Vol.2
DE94007492	LBL–33962
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DE94007504	LBL–33819
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DE94007581	DOE/SWPA–9401
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DE94007586	DOE/BP–91819-5
DE94007587	DOE/BP–1913
DE94007588	DOE/EIS–0194-Summ.
DE94007589	DOE/BP–1979
DE94007590	DOE/BPA–2000
DE94007591	DOE/BP–2256
DE94007592	DOE/BP–2318
DE94007593	DOE/BP–62611-3
DE94007594	DOE/BP–2285
DE94007595	DOE/EIS–0194-Vol.1
DE94007596	DOE/EIA–0538(93/94-21)
DE94007603	DOE/ER/61127–3
DE94007605	DOE/ER/13590–13
DE94007607	DOE/ER/13480–4
DE94007609	LA-UR–94-538
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DE94007623	ANL/CHM/CP–81637
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DE94007633	ANL/RA/CP–81715
DE94007634	ANL/IFR/CP–80791
DE94007635	ANL/RA/CP–81724
DE94007642	ANL/RA/CP–81815

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DE94007643	ANL/EA/CP–81915
DE94007647	ANL/ES/CP–82079
DE94007650	ANL-HEP-CP–94-08
DE94007655	ANL/EA/CP–80977
DE94007656	ANL-HEP-TR–94-12
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DE94007658	DOE/EH–94007658
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DE94007661	PPPL–2961
DE94007662	PPPL–2960
DE94007664	PPPL–2957
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DE94007667	SLAC–431
DE94007668	SLAC–362
DE94007671	ANL/APS/PP–73889
DE94007672	ANL/MSD/PP–74972
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DE94007682	DOE/MT/93007–T1
DE94007684	ANL/MSD/CP–82175
DE94007686	ANL/MSD/CP–82165
DE94007694	ANL/MSD/CP–82054
DE94007695	ANL/CHM/PP–80246
DE94007696	ANL/EA/CP–80976
DE94007697	ANL/MSD/CP–78618
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DE94007724	LA–12748-MS
DE94007725	LA–12712-MS
DE94007726	LA–12703-SR
DE94007727	LA–12742-MS
DE94007728	LA–12755-MS
DE94007729	SAND–94-0107C
DE94007730	SAND–93-3966C
DE94007731	SAND–93-1724C
DE94007737	SAND–94-0552C
DE94007738	SAND–93-1785C
DE94007741	SAND–94-0658C
DE94007743	SAND–94-0163C
DE94007744	SAND–93-3967C
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DE94007753	SAND–93-3792
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DE94007764	UCRL-ID–115729
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DE94007767	DOE/ID/01570–T172
DE94007769	DOE/NV/10872–T85
DE94007777	DOE/NV/10872–T91
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DE94007779	DOE/NV/10872–T93
DE94007784	DOE/NV/10872–T98
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DE94007796	DOE/BC/14951–3
DE94007797	DOE/BC/14884–3
DE94007798	DOE/BC/14884–4
DE94007799	DOE/BC/14860–3
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DE94007802	DOE/BC/14652–11
DE94007803	DOE/BC/14479–16
DE94007804	DOE/BC/14474–11
DE94007805	DOE/MT/92012–5
DE94007806	DOE/MT/92011–6
DE94007807	DOE/MT/92001–1
DE94007810	HW–22201-Del.
DE94007813	ARH–263-RD
DE94007816	ARH–1394
DE94007817	ARH–1943
DE94007818	ARH–2036
DE94007819	ARH-CD–962
DE94007823	BNWL-C–119
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DE94007835	LA–12713-MS
DE94007838	DOE/EM–0139P
DE94007839	SAND–92-1728
DE94007841	SAND–92-2891
DE94007842	SAND–93-1959
DE94007843	SAND–93-4085
DE94007844	SAND–93-4088
DE94007847	UCRL-ID–115869
DE94007848	UCRL-ID–116110
DE94007849	UCRL-ID–116123
DE94007858	SAND–93-2556C
DE94007859	SAND–94-0254C
DE94007869	UCRL-JC–107581
DE94007872	CPD–220-Add.
DE94007873	DUN–5538-RD
DE94007879	HAN–89378
DE94007881	DUN–1728
DE94007886	HW–61082
DE94007887	HW–69561
DE94007889	HW–71619-RD-Rev.1
DE94007890	HW–75958-RD
DE94007893	HW–77942
DE94007894	HW–78741
DE94007895	HW–79468
DE94007896	HW–79944
DE94007897	HW–80937
DE94007898	HW–81295-12
DE94007906	DOE/EIA–0130(94/02)
DE94007913	ANL/FC/CP–79262
DE94007914	SAND–93-3829C
DE94007915	ORNL/M–3198
DE94007916	ORNL/CON–318
DE94007917	ES/CSET–19
DE94007918	ORNL/TM–12642
DE94007919	ES/ER/TM–101
DE94007921	UCRL-CR–116290
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DE94007924	DOE/EIS–0200
DE94007925	DOE/EM–94007925
DE94007929	UCRL-JC–116117
DE94007930	UCRL-JC–114997
DE94007931	UCRL-JC–114681
DE94007932	SAND–94-0317C
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DE94007949	DOE/CE/90053–T60
DE94007950	DOE/ER–0610T
DE94007951	DOE/CE/90053–T62
DE94007952	DOE/ER/13869–5
DE94007953	DOE/NV/10630–57
DE94007954	DOE/ER/10666–10
DE94007960	DOE/NV/10630–63
DE94007961	CONF-9306258–
DE94007963	DOE/EIA–0109(94/02)
DE94007964	DOE/EIA–M055
DE94007965	DOE/EIA–M056
DE94007966	WSRC-TR–93-468
DE94007968	WSRC-RP–94-96
DE94007969	WSRC-RP–93-1604
DE94007971	WSRC-MS–93-550
DE94007973	DOE/ER/00038–3674
DE94007974	DOE/CH–9202
DE94007975	DOE/WIPP–94-008
DE94007976	BNL–60040
DE94007977	BNL–60038
DE94007979	BNL–49654
DE94007980	BNL–60099
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DE94007991	DOE/RL–93-76
DE94007992	DOE/RL–93-38
DE94007993	DOE/PC/90545–T10
DE94007995	DOE/PC/91308–9
DE94007997	DOE/PC/92119–T2
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DE94008003	DOE/PC/91057–T6
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DE94008045	PNL-SA–22723
DE94008046	PNL-SA–22797
DE94008049	DOE/WIPP–93-022
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DE94008052	PNL-SA–23650
DE94008054	PNL-SA–23410
DE94008055	PNL-SA–23331
DE94008056	PNL-SA–23035
DE94008057	PNL–8834
DE94008058	PNL-SA–23686
DE94008059	PNL-SA–23727
DE94008060	PNL–9223
DE94008061	ORNL/ER–172
DE94008062	ORNL/ER–204
DE94008063	ORNL/ER–164
DE94008064	CONF-9311155–

Order No.	Report No.
DE94008065	DOE/CH–9215
DE94008067	DOE/ER/14236–2
DE94008068	DOE/ER/61487–2
DE94008075	LA-SUB–94-39
DE94008077	WHC-SA–2304
DE94008080	UCRL-ID–106454-94-1
DE94008084	USGS-OFR–93-60
DE94008086	DOE/PC/93214–T1
DE94008088	DOE/PC/92120–T1
DE94008089	DOE/ER/75666–1
DE94008091	BNL–49736
DE94008092	BNL–49738
DE94008096	LA-SUB–94-41
DE94008097	LA-SUB–93-296
DE94008098	LA-SUB–93-227
DE94008104	ANL/CHM/PP–75063
DE94008105	ANL/CHM/PP–75156
DE94008106	ANL/CHM/PP–73485
DE94008107	ANL/CHM/PP–74944
DE94008108	ANL/PHY/PP–73096
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DE94008111	SAND–93-2263
DE94008112	SAND–93-7072
DE94008113	SAND–94-0158
DE94008114	ANL/CHM/PP–72140
DE94008115	ANL/APS/PP–69709
DE94008116	ANL/EAIS/PP–77719
DE94008117	ANL/PHY/PP–71811
DE94008118	ANL/MSD/PP–71900
DE94008120	ANL/APS/PP–73435
DE94008121	ANL/MCT/PP–72080
DE94008122	ANL/MCT/PP–71813
DE94008123	ANL/MSD/PP–71503
DE94008124	ANL/MSD/PP–73288
DE94008125	ANL/MCS/PP–76764
DE94008126	ANL/MSD/PP–71896
DE94008127	ANL/MCS/PP–75914
DE94008128	ANL/MCS/PP–73012
DE94008129	ANL/MCT/PP–72890
DE94008130	ANL/PHY/PP–74767
DE94008131	ANL/CHM/PP–76144
DE94008132	ANL/MCT/PP–72124
DE94008133	ANL/CHM/PP–75639
DE94008134	ANL/CHM/PP–75637
DE94008135	ANL/MSD/PP–77692
DE94008136	ANL/CHM/PP–75638
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DE94008138	ANL/MCT/PP–71579
DE94008139	ANL/CHM/PP–77676
DE94008140	ANL/CHM/PP–76968
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DE94008144	DOE/PC/88801–T8
DE94008145	DOE/PC/88801–T9
DE94008146	DOE/PC/88801–T10
DE94008147	DOE/PC/88801–T11
DE94008148	DOE/PC/88801–T12
DE94008149	DOE/PC/88801–T13
DE94008150	DOE/PC/88801–T14
DE94008151	DOE/PC/88801–T15
DE94008164	LA–12737-M
DE94008166	DOE/ID/12695–T1
DE94008167	LA-SUB–94-45
DE94008171	NIPER–658
DE94008173	DOE/PC/89783–T9
DE94008174	DOE/PC/89783–T10
DE94008175	DOE/PC/89783–T11
DE94008176	DOE/ID/12735–T29
DE94008177	DOE/ER/60660–T1
DE94008178	DOE/PC/93203–T1
DE94008179	DOE/ER/45415–T1
DE94008187	DOE/BC/14831–5
DE94008188	DOE/BC/14831–6
DE94008190	DOE/BC/14652–14
DE94008191	DOE/ER/53243–5
DE94008192	DOE/EH–231-012E/0593
DE94008193	DOE/EH–231-033/0793
DE94008194	DOE/EH–012b/0593
DE94008195	DOE/EH–231-0181/0992
DE94008202	DOE/EH–231-022/1193
DE94008204	DOE/EH–231-039/1193
DE94008205	DOE/EH–231-021/0993
DE94008206	DOE/EH–231-036/0793
DE94008207	DOE/EH–231-026/0593
DE94008208	DOE/EH–231-023/0793
DE94008210	DOE/EH–231-022/0793
DE94008211	DOE/EH–231-035/0693
DE94008212	DOE/EH–231-034/0593
DE94008213	DOE/EH–231-021/0293
DE94008214	DOE/EH–231-012D/0194
DE94008215	DOE/EIA–0538(93/94-22)
DE94008216	UCRL-JC–115806
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DE94008220	FNAL-TM–1868
DE94008222	FNAL/C–93/403-E
DE94008223	FNAL/C–94/006-E
DE94008224	FNAL/C–94/031
DE94008226	WSRC-TR–93-563
DE94008231	SAND–94-8219
DE94008233	UCRL-ID–115845
DE94008242	ORNL–6747
DE94008245	DOE/AL/62350–108
DE94008246	DOE/AL/62350–109
DE94008249	DOE/EIA–0575(94)
DE94008252	DOE/EIA–0570(92)
DE94008256	DOE/EIA–0566
DE94008261	DOE/ER/25145–T1
DE94008265	DOE/ER/61552–1
DE94008268	DOE/NV/11432–40
DE94008269	FNAL/C–92/261
DE94008270	FNAL/C–93/404-E
DE94008271	FNAL/C–94/035-E
DE94008275	WSRC-TR–92-557-Rev.1
DE94008279	UCRL-ID–115962
DE94008280	UCRL-ID–115481
DE94008281	UCRL-LR–105820-88/89
DE94008282	UCRL-ID–116320
DE94008283	DOE/EIA–0538(93/94-23)
DE94008295	UCRL-JC–114133
DE94008297	UCRL-JC–116851
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DE94008305	DOE/PC/91296–9
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DE94008309	UCRL-ID–116209
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DE94008312	SAND–93-2687
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DE94008319	UCRL-ID–116187
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DE94008322	DOE/PC/92544–6
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DE94008326	DOE/PC/92536–T4
DE94008329	DOE/PC/92535–T5
DE94008330	DOE/PC/92117–T6
DE94008331	DOE/PC/92548–T5
DE94008341	DOE/SF/19645–T3
DE94008349	DOE/ER/75711–1
DE94008351	DOE/ER/14340–1
DE94008352	DOE/ER/14333–1
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DE94008376	DOE/PC/91295–T8
DE94008378	DOE/PC/91311–T9
DE94008379	DOE/PC/91303–T9
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DE94008383	DOE/PC/91299–13
DE94008384	DOE/PC/92111–T4
DE94008385	DOE/PC/92108–T4
DE94008386	DOE/PC/92108–T5
DE94008388	DOE/ER/40711–T1
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DE94008392	SR/H–689
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DE94008426	ANL-HEP-TR–94-13
DE94008432	ERA-NRE–94-008
DE94008435	SLAC–430
DE94008437	SLAC–428-Vol.3
DE94008449	DOE/ER/40757–322
DE94008450	DOE/ER/61221–2
DE94008451	DOE/ER/45197–8
DE94008469	ANL/XFD/PP–76784
DE94008473	ANL/MCT/PP–76194
DE94008474	ANL/CHM/PP–73178
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DE94008476	ANL/CMT/PP–71628
DE94008477	ANL/CMT/PP–75501
DE94008481	ANL/CHM/PP–76819
DE94008482	ANL/CMT-ACL/PP–72621
DE94008483	ANL/CMT/PP–71738
DE94008485	ANL/CHM/PP–75740
DE94008486	ANL/RE/PP–73076
DE94008487	ANL/CHM/PP–76357
DE94008488	ANL/CHM/PP–76828
DE94008489	ANL/EAIS/PP–75667
DE94008490	ANL/CHM/PP–74824
DE94008493	ORNL/TM–12698
DE94008494	ORNL/M–3155
DE94008501	DOE/ER/14317–T1
DE94008503	DOE/ER/60522–7
DE94008513	DOE/LLW–193
DE94008514	EGG-EP–10948
DE94008515	EGG-EP–10999
DE94008517	EGG-SCM–10713
DE94008518	EGG-NPR–10795
DE94008519	EGG-SCM–10804
DE94008525	EGG-RAAM–10980
DE94008551	DOE/ER/45372–6
DE94008552	DOE/CE/23810–14
DE94008563	DOE/BP–2325
DE94008571	DOE/ER/14315–T1
DE94008572	DOE/ER/54137–T1
DE94008587	DOE/ER/45482–1
DE94008588	DOE/ER/14304–1
DE94008589	EGG-WTD–10784-Vol.1
DE94008590	EGG-WTD–10784-Vol.2
DE94008591	EGG-WTD–10784-Vol.3
DE94008619	DOE/FE–0297P
DE94008621	ANL/ESD–19
DE94008625	LA–12699
DE94008635	DOE/MC/24257–3687
DE94008646	DOE/RL–93-21-Vol.2
DE94008648	PNL–8370
DE94008649	PNL–8383
DE94008663	BNL–70395
DE94008792	DOE/ID–10447
DE94008796	DOE/ID–10500

Order No.	Report No.
DE94612870	CFFTP-G–9198
DE94613216	AECL–10230
DE94613218	INFO–0424
DE94613604	CEA-CONF–11463
DE94613809	EDF–93-NB-00088
DE94614091	SKI-TR–93-30
DE94615287	IPEN-PUB–392
DE94615301	BARC–1993/P/005
DE94615302	NSS-R–272
DE94615378	BARC–1993/E/013
DE94615380	INP–1505/C
DE94615381	INP–1610/C
DE94615382	IPEN-PUB–390
DE94615424	IPEN-PUB–381
DE94615443	INIS-mf–13754
DE94615464	INIS-RU–349
DE94615484	INIS-mf–13794
DE94615510	ITP–92-54E
DE94615511	ITP–93-12E
DE94615584	BARC–1993/E/017
DE94615585	IPEN-PUB–389
DE94615646	ITP–93-30E
DE94615647	ITP–93-37E
DE94615768	INIS-RU–361
DE94615814	NEI-SE–143
DE94615824	IAEA-TECDOC–726
DE94615837	SKB-TR–93-15
DE94615844	INIS-BR–3238
DE94615849	ITF–93-11U
DE94615858	INP-MSU–93-3-295
DE94615861	INIS-BR–3239
DE94615903	INIS-mf–13775
DE94615904	IPEN-PUB–387
DE94615912	INIS-BR–3246
DE94615913	INIS-BR–3247
DE94615965	INIS-GB–559
DE94615974	FOA-C–40306-4.3
DE94615975	IAEA-TECDOC–718
DE94615976	RISO-HOT-DECOM-P–6
DE94616012	IAEA-TECDOC–727
DE94616078	INIS-mf–13800
DE94616092	INIS-mf–13796
DE94616106	BARC–1993/E/016
DE94616109	INIS-RU–372
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DE94616168	NIIEFA-P-B–0884
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DE94616200	INIS-RU–362
DE94616201	IYaF–92-62
DE94616202	NIIEFA-P-K–0887
DE94616233	INIS-RU–373
DE94616234	IYaF–91-25
DE94616235	IYaF–92-79
DE94616241	BARC–1993/E/015
DE94616242	BARC–1993/E/019
DE94616243	ISRP-K-TD–1
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DE94616271	BARC–1993/E/023
DE94616280	IAEA-TECDOC–724
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DE94616303	NEI-SE–141
DE94616330	IAEA-TECDOC–722
DE94616341	BARC–1993/E/012
DE94616342	INIS-mf–13755
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DE94616344	FEI–2197
DE94616345	FEI–2212
DE94616353	INIS-mf–13753
DE94616354	IPEN-PUB–391
DE94616426	JINR-R–6-93-139
DE94616453	IYaF–91-96
DE94616454	IYaF–92-28
DE94616455	JINR-R–1-93-195
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DE94616487	NEI-SE–142
DE94616488	NIIYaF-MGU–92-11-260
DE94616508	BARC–1993/E/020
DE94616509	JINR-R–6-92-427
DE94616522	AEA-D and R–0019
DE94616528	DOE-HMIP-RR–93.033
DE94616529	SKB-TR–93-14
DE94616530	SKB-TR–93-18
DE94616595	NEI-SE–145
DE94616597	INIS-mf–13783
DE94616602	AEA-FS–0229-H
DE94616604	IYaF–92-42
DE94616605	NIIEFA-P-V–0869
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DE94616607	INIS-GB–558
DE94616613	JINR-R–2-92-485
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DE94616616	INP–1578/PH
DE94616617	INP–1579/PH
DE94616618	ITF–92-10R
DE94616619	ITP–93-29E
DE94616620	ITP–93-5E
DE94616621	IYaF–93-12
DE94616637	NIIYaF-MGU–91-4-208
DE94616649	IFT-P–051/93
DE94616650	IFT-P–060-93
DE94616651	IFT-P–064-93
DE94616652	IFT-P–068-93
DE94616653	IFT-P–069-93
DE94616654	IFT-P–070-93
DE94616655	UNICAMP-IMECC-RP–46/93
DE94616660	ITP–93-21E
DE94616661	NIIYaF-MGU–91-14-218
DE94616768	ITP–93-32E
DE94616769	ITP–93-36E
DE94616775	IFT-P–059-93
DE94616787	ITF–93-3R
DE94616788	IYaF–92-2
DE94616799	ITP–93-8E
DE94616800	JINR-E–2-93-164
DE94616852	IFT-P–066-93
DE94616853	ITP–92-40E
DE94616869	BUDKERINP–92-55
DE94616870	INP–1608/PH
DE94616886	INP–1596/PH
DE94616887	ITP–93-14E
DE94616888	ITP–93-25E
DE94616889	ITP–93-31E
DE94616907	IYaF–92-94
DE94616928	JINR-R–2-93-160
DE94616951	ITP–92-51E
DE94616952	ITP–93-38E
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DE94616983	ITF–93-4R
DE94616988	BARC–1993/P/006
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DE94616990	ITF–92-23R
DE94616991	ITF–92-43R
DE94616992	ITF–92-48U
DE94616993	ITP–93-24E
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DE94617009	FEI–2253
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DE94617011	NIIYaF-MGU–91-20-224
DE94617031	INP–1599/PL
DE94617044	JINR-E–1-92-372
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DE94617051	NIIYaF-MGU–92-8-257
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DE94617057	ITP–93-40E
DE94617087	ITP–93-4E
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DE94617116	NIIEFA-P-B–0896
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DE94617189	ITF–93-2R
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DE94617216	IYaF–93-5
DE94617229	FEI–2227
DE94617253	NIIEFA-P-NILSA–0880
DE94617257	NIIEFA-P-B–0904
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DE94618108	BUDKERINP–92-35
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DE94618116	BUDKERINP–91-119
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DE94618221	INIS-BR–3252
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DE94618331	INIS-mf–13827
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DE94618346	NKS–93-9
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DE94618504	IYaF–91-46
DE94618505	JINR-E–2-92-175
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DE94618512	BUDKERINP–92-97
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DE94618516	IPNO-TH–93-08
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US United States
UY Uruguay
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VC Saint Vincent and the Grenadines
VE Venezuela
VN Viet Nam
VU Vanuatu

WS Samoa

YE Yemen, Republic of
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire
ZW Zimbabwe

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ED EANDC [European American Nuclear Data Committee]
EP European Patent Office
IO ILO [International Labor Organization]
IX IUPAC [International Union of Pure and Applied Chemistry]
QS INSPEC [Information Service in Physics, Electrotechnology and Control]
QZ INPADOC [International Patent Document Centre]
WO WIPO [World Intellectual Property Organization]
XA IAEA [International Atomic Energy Agency]
XC CERN [European Organization for Nuclear Research]
XD OECD [Organization for Economic Co-Operation and Development]
XE CEC [Commission of the European Communities]
XF FAO [Food and Agricultural Organization of the United Nations]
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XJ JINR [Joint Institute for Nuclear Research]
XK WMO [World Meteorological Organization]
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